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# Storing and Clarifying Oil in Shops

## Methods Used in Twelve Well-Known Plants—Tanks, Separators, Mixtures and Other Details—Clarifying Reduces Danger of Infection to Workers

THE handling of oil, both cutting and lubricating, is a problem that may be attacked in many ways. Some side-step it altogether but the great majority attempt some sort of solution, varying with their needs and the expenditure which is felt to be justifiable.

A few plants have installed quite elaborate chip and oil houses for cleaning the oil from chips, for clarifying the oil, and returning it to the system from which the shop is supplied. The question of keeping cutting oils and compounds clean and sanitary is also receiving more attention. Comparatively few shops seem to have a well-planned system of looking after oil expense, although shops which have made a study of the problem feel that it well repays all their time, trouble and cost. Some contend that clean, filtered oil, free not only from chips but from the minute particles which seem to wear from tools and bearings and form a sludge, helps to secure accurate work. Impure cutting oils are said to increase the percentage of scrap and otherwise interfere with obtaining accurate work.

CAN YOU SAVE money by reclaiming the oil used in your plant? Replies to inquiries made by *American Machinist* indicate a difference of opinion as to the economy of filtering and clarifying oils.

Each plant should know the best way to handle its oils. As guides to what may be done and what may be expected, study these opinions of some who have carried on investigations in their plants.

In order to show just what some of our leading shops are doing in this matter we are reprinting a number of letters received in response to our inquiry concerning their methods. These letters give a brief outline of their experiences with different systems, or without special apparatus, in some cases. Here they are:

### American Tool Works Co.

We are using the Richardson-Phenix system, with a capacity of 1,200 gallons, which provides a gravity delivery from our screw machine pans to the filter station. Here the oil is filtered and chemically sterilized before being returned to the screw machines by means of a motor-driven pump.

We have found the advantages to be as follows: No petty pump troubles, slipping belts, etc. No priming of pump after each stopping of the machine. Uniform pressure without surge. Increased volume of flow. Pans on machines practically dry. Chips have time to drain, leaving but little oil to be removed in centrifugal machine. Work is cleaner, with little clinging oil, consequently less waste. Floors kept much cleaner. Clean oil permits higher cutting speeds, also gives longer life to the cutting edges of tools.

We have no comparative figures showing the difference between the new and old systems, but have observed the advantages enumerated above during the five years' usage of this system.

We have not noticed any advantages from the standpoint of the quality of work, as the variation of work is usually attributed to poor tool design or grinding, rather than to oil. We have tried several kinds of oil with varying degrees of satisfaction, finally determining upon a mixture of about 50 per cent each of lard and mineral oils.

We have no means for filtering and clarifying used oils. We had some used motor crankcase oil, mostly Mobile A brand, filtered and clarified. We mixed this filtered oil with an equal quantity of new so-called engine oil, the regular oil used for lubricating machine tools and transmission machinery around the shop. We found it would not do for electric motor bearings and abandoned it there. We then mixed it 30 new and 70 old, and have used it so for some time for general run of shop transmission oiling. We question, however, the economy of its use, believing the most efficient oiling effect that can be secured from new oil is none too good. To use a poor oil means more friction, more power and more coal. To use filtered oil mixed with good oil means that the friction reducing qualities of the good oil are decreased. We have therefore abandoned the filtration of oil and are now mixing the used oil with fuel oil and burning it in our heat-treating furnaces.

For oil storage we have a fireproof oil room with a barrel-size, round vertical sheet-iron tank with tin pump—such as can be had from any supply dealer—for each kind of oil used. We believe that barrel-size square oil-storage tanks with good substantial pumps, such as are furnished singly or in multiple by several concerns, placed in fireproof oil room for main storage are good.

We also use 10 to 20 gal. tanks with pumps, placed at frequent intervals around the shop. This seems to be about as good an all around system as can be devised for a small plant like ours. Our shop hardly warrants a piping system from a central station.

We believe it is a good plan to have an oil distributing station in the toolcrib, and have hand oilcans filled by an attendant from pump tanks, and passed out immediately on call.

Under our scheme we store all tools, jigs and fixtures used exclusively in our department in one place, under the care of the foreman and his general laborer and trucker. In this connection we believe it is very economical to have a 10-gal. supply can regularly replenished by the department laborer and placed conveniently for operators to help themselves.

We do not use oil for cutting on any machines except a gear hobber. This oil is filtered only, and used over again.

### Brown & Sharpe Manufacturing Co.

We have given considerable thought to the question of the purifying of oil and have experimented to some extent in the use of clarified oils, but in the slight experience that we have had we have felt that as far as better cutting qualities were concerned, there was no gain in the transaction.

We put all of our chips through a centrifugal machine, and we know that there would be some saving if we treated the chips still further by the use of steam, but from any data that we have been able to collect, we feel that the amount that would be saved would not be sufficiently large to warrant the expenditure and the use of room to undertake this operation. Clarified oil, of course, is better to handle and more attractive.

As to storage, we receive oil in barrels and keep it there, carrying it in the barrels to such parts of the works

as we may require it. We have fitted trucks upon which the barrels can be placed, and easily emptied into the receptacles at the point of use. After whipping out the chips the oil is collected in barrels and mixed with other oil as it comes to use.

### Elgin National Watch Co.

The best grade of lard oil is used in our automatic machines. As it thickens, we put in machine oil to permit of its passing through the felt filter as it returns to the machines from the oil tanks.

The oil is used for both lubricating and cutting. It is pumped into the machines and returned again and again to the tank through the filter and back. We find that the oil deteriorates by constant use and find it profitable to replace it in about six months after continuous use.

### Table of Oil Tests

These tests were made by sawing slots in stacks of watch main winding wheels until the saw broke.

Direction of saw while running, against the work. Saws 0.008 in. thick; temper, dark straw color; speed of slide, 1 ft. per min.; speed of saw, 219 ft. per minute. Oil from tank passed through a 0.15-in. hole on to saw; three saws used in each test.

| Kind of Oil | No. of Slots 1st Saw | 2nd Saw | 3rd Saw | Total No. of Slots | Average Slots Per Saw |
|---|---|---|---|---|---|
| Renown — Lard | 1 | 1½ | ½ | 3 | 1 |
| Renown 75% — Lard 25% | 2½ | 3½ | 9½ | 15½ | 5½ |
| Renown 50% — Lard 50% | 340 | 139 | 375 | 854 | 284½ |
| Ft. Lincoln — Lard | 8½ | 1½ | 5½ | 15½ | 5½ |
| Ft. Lincoln 75% — Lard 25% | 5 | 2½ | 19 | 26½ | 8½ |
| Ft. Lincoln 50% — Lard 50% | 464 | 144 | 427 | 1035 | 345 |
| Lard | 670 | 1380 | 1130 | 3180 | 1060 |

### H. H. Franklin Manufacturing Co.

Our original chip handling installation was very crude and consisted of transferring all chips by the wheelbarrow method and elevators to the basement, where they were put through a pair of ordinary belt-driven extractors and a portion of the oil extracted in this way. Eight men were required to transport the chips from the machine shops to the oil extracting department.

With the present system, which has been in operation about two years, a vertical chip chute was extended from the sixth floor of our machine shop building to the third floor, passing through each of the machine shop departments with the exception of one located on the second floor of the building mentioned. The chips are dumped directly from trucks and wheelbarrows on the individual floors into this chute, and are carried by gravity to a chip storage bin in the oil reclaiming department.

The equipment in this department consists of a steam-driven extractor and two DeLaval centrifugal machines, one for clarifying and the other for purifying the reclaimed oil. The chips are loaded by means of forks into the large baskets of the extractor and the baskets are handled by a light air-operated hoist from this position into the extractor itself.

The extractor is turbine driven and the exhaust from the turbine is delivered directly to the basket of chips, where its heat results in a thinning and freeing of the oil from the chips. The extracted oil drains by gravity into a sump, where it is pumped to an overhead storage tank and where it is again lead by gravity through the clarifier and purifier in series, and then pumped directly into an oil storage tank on the floor above, where it can be drawn by gravity into the distribution truck tanks whenever it is needed.

In regard to the saving effected by this method, it can be summarized in the following manner:

| | |
|---|---|
| The total yearly saving, based on normal production, in labor required to handle the chips | $3,900 |
| Saving in oil over the old system, per year | 26,000 |
| Total yearly saving at 65c. per ton in loading of chip cars | 1,352 |
| Total yearly saving | $31,252 |

We neglected to mention the fact that locating the oil reclaiming room on the third floor permitted us to place the chip storage bins directly over the railroad track, where the chips are lead by direct chutes into the cars.

In reference to the advantage of a carefully clarified oil over the use of a new oil, we cannot say that we are particularly enthusiastic over recommending a reclaimed oil in place of fresh oil. We find the opposite to be the case. That is, the reclaimed oil—in order to produce results comparable with the exclusive use of new oil—requires the addition of about 25 per cent of fresh oil to the reclaimed product.

We have at several times experienced some trouble with oil foaming in the automatic screw machines. We have finally traced this trouble to the apparent presence of water in the reclaimed oil, and believe that it is due entirely to the defective operation of the separators used for extracting the water and other impurities. As a basis for future installations, we would strongly recommend the use of a belt-driven extractor in place of the steam-driven machine which we are using, and the elimination of the direct heating of the chips by steam. It might be possible to arrange for an indirect heating of this extract, without the danger of too much condensation entering the extracted oil.

### General Electric Co.

The General Electric Company uses both DeLaval centrifugal clarifiers and Richardson-Phenix screen filters. The DeLaval clarifiers are used chiefly for filtering bearing oils used in testing machines. The oil reclaimed in the testing section is again used in machine bearings in further test. The Richardson-Phenix filters are used in connection with turbine extractors for reclaiming oil from chips and turnings in the automatic and machine departments. The oil reclaimed in these departments is first built up or renewed by the addition of a small portion of new oil.

In regard to extracting oil from chips and turnings, we use centrifugal extractors located in various sections of our plant either in or in close proximity to our automatic and machine departments. The amount of oil which may be extracted from a ton of chips varied according to local conditions. In shops where chips and turnings are allowed to drain, for a period of ten or twelve hours, the amount of oil reclaimed by the extractor will average approximately 15 or 20 gal. per ton of chips. Where chips are taken immediately from machine pans and put into the extractor, the amount of oil reclaimed will obviously be very much greater.

Referring to the question of whether in our experience clarified oil gives a more uniform product and increased percentage of perfect work, would state that this proposition may be said to be a self-evident one. The higher the point to which oils are clarified and refined, whether oils in original form or used oils, the more uniform and satisfactory would be the result of the machine processes with a corresponding decrease in defective work.

**WHERE OIL RECLAMATION** is practiced the use of standard separating machines of the centrifugal type seems to be almost universal. For cleansing and purifying, the oil is then led to reservoirs, filters and clarifying apparatus in turn. New oil is added in all cases to maintain the standard necessary for good work.

Sterilizing and clarifying oils may eliminate skin affections which are all too common in many shops.

### Meisel Press Manufacturing Co.

We use a refrigerant base, diluted with paraffine in exact proportions.

When it is necessary to refill a machine, we drain off all old oil and refill with the new mixture in the exact proportions, so maintaining a uniform standard of cutting oil.

The old oil drained off (which as you will appreciate, has accumulated much foreign matter, such as kerosene oil, chips, etc.) is placed in a filtering tank, and after being filtered, is sterilized, and pumped into a storage tank, and then used as a carrier for diluting with new refrigerant base.

There is no question in our minds but that a clarified cutting oil is conducive to better results, since it is free from foreign matter, such as chip dust, or, in other words, chips that have become very minute like powder grains. This chip dust destroys the cutting edges of tools, and

prevents the best quality of finished surface on the products.

Larger sized turnings and chips are put through an oil extractor and the oil from this process goes through the same filtration and sterilizing process as above mentioned.

We presume it is generally appreciated that the price per gallon of oil as used by our method, is gradually lowered from the first cost, until it is necessary to purchase more paraffine, because as long as there is sufficient quantity of oil in the filtration tank, the cost of oil consists only for the cost of new refrigerant base, plus the cost of filtration and sterilizing of old oil. So a cutting oil whose first cost represents cost of refrigerant base, plus cost of paraffine, and which, in the proportion we dilute, might represent 45 cents per gal. eventually may cost only half that.

We also believe that cutting oil has a relative proportionate tangible value to machine oil, as regards its effect on the overhead burden upon a machine, and that a first-class cutting oil, therefore, is just as good insurance, as pertains to machine equipment, as is fire protection for buildings.

PEERLESS MOTOR CAR CO.

Our cutting oils are bought by the barrel and stored in two 1,000 gallon tanks. From these tanks the supply as needed is pumped by means of Wayne hand oil-tank pumps into a Wayne portable lubricating cart. In this way the cutting oil is delivered from the oil shed to the different departments and machines as new oil is required.

In connection with the machines we have an oil separating and clarifying department. The oily chips and work are brought from the automatic screw machines in metal boxes and then forked or shoveled into a 36-in. separator, centrifugal type, made by the Oil and Waste Saving Machine Co., Philadelphia, Pa. From this separator the oil flows to a reservoir of 50 gal. capacity. From the reservoir the oil is pumped into a Peterson power-plant oil filter, Size 13, made by the Richardson-Phenix Co., Milwaukee, Wis.

After the oil is filtered it is supplied to the machines as required. New oil is added as required to keep life in the oil. In this way we are using the cutting oil over and over again. The cutting oil we are using is a mixture of Fiske Bros. No. 1770 oil and C. H. Clark oil.

Regarding cutting oils that are clarified, I have looked into this matter and taken it up personally with some of our factory men. I cannot see where you can gain a better lubricant by using the same oil over and over again by filtering, clarifying or sterilizing same. It seems to me that the oil being used for a long time, a certain amount of life is taken out and it will get thinner, and a certain amount of impurity will mix in with it. We add new oil to the oil that has been clarified and in this way try to keep the body and life in our oils.

We have noticed something peculiar about oils that have been sterilized and filtered. We have two filtering stations, one in the screw machine department and one in the motor running department. Before we installed the filtering stations our men were troubled with skin affections such as pimples, boils, etc. Now this trouble has ceased.

I would not like to say that this trouble was caused by the oils, as it may have been an epidemic of some kind at that particular time, but the same trouble happening in both departments and being eliminated, it would seem as though it was caused by impurities in the oils.

PRATT & WHITNEY CO.

Our practice is to keep separate the chips from the departments using widely different oils and by means of chutes to run them into large settling bins from which, by gravity draining, we reclaim about one-half the total quantity of oil. The chips are then put in a centrifugal separator and the remainder of the oil extracted. Tests have shown that what little oil is left in the chips is not over 1 per cent by weight. This oil is then run through several DeLaval machines, one for extracting liquid, such as moisture, and one for extracting solid matter. The oils are heated to render them antiseptic.

The resulting oil we have found to be the equal of new oil as far as productive results have shown. It is not quite as clear, but this may be due in our works to the admixture of small quantities of black oil which is still used in some instances. We have found that thirteen baskets of six bushels each, of chips each yield 148 gal. of oil, or, roughly, 2 gal. to the bushel.

WESTINGHOUSE AIR BRAKE CO.

In order to secure a good finish on parts from our automatic screw machines, it is necessary to filter the cutting oil periodically. In our practice the oil is filtered on an average of every three or four weeks.

The oil used in our standard production of motor-driven compressors during wearing in and test, is purified and used over and over again and until recently we used an ordinary oil filter but have lately installed a DeLaval centrifugal separator, which has given very satisfactory results. This machine has materially reduced the abrasion on the bearings due to the total elimination of fine sand and metallic particles in the oil.

WHITE SEWING MACHINE CO.

We do not reclaim any oil in our plant. We collect certain kinds of oil, however, such as coal oil, and return it to the refinery for credit which they allow us. The amount of oil we use is comparatively small; in fact, so small as not to warrant the installation of equipment for reclamation.

In regard to cutting oils, we have not found it necessary to filter the oil, or otherwise clarify it other than is done in the individual automatics and screw machines—that is, using the strainer and settling tank, which is an integral part of the machine itself.

We are well aware of the claims made by some of the manufacturers of mechanical filters. It has been our observation, however, backed up by the experience of our operators who have worked in other plants on similar classes of work, that there is no great saving nor betterment to be expected by the clarifying of the oil. We find that far greater results are obtained for better work by choosing the proper oil.

I wish to add, however, that if our raw stock contained mill scale such as if found on hot-rolled stock we might find it necessary to filter the grit and abrasive substances out of the oil. Our raw stock, however, is all cold-drawn, which possibly explains why we do not take extra care of the filtering of the oil.

WHITIN MACHINE WORKS

We have just installed a DeLaval system of oil filtration which is used in connection with a steam operated Oil and Waste Company's centrifugal extractor, and can report the best results. We have made very large savings in the amount of oil reclaimed from our chips.

The hospital reports also that scratches and wounds heal much quicker now that the oil has run through this pasteurization process and the workmen would rather use the reclaimed oil than the new oil in many cases.

We have combined this machinery with an oil storage building which has also worked out to our satisfaction. We feel that the DeLaval system of reclaiming the oil is the best that we have seen.

## Increasing Production by Personal Consideration

BY CHARLES W. LEE

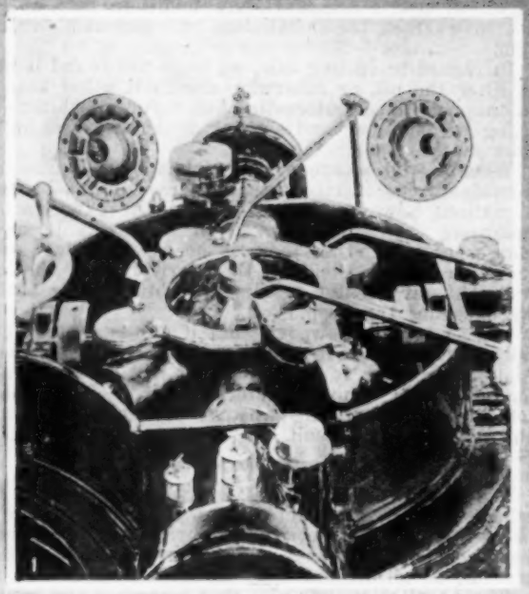
The subject of increased production has been so much in vogue during the—shall we say recent—inactivity, that a few words along that line may not be amiss.

The superintendent of a factory that I used to visit was much annoyed because some of "the hands" were in the habit of using the window ledge outside his office as a seat during the noon hour, and accordingly caused to be made and fastened on the ledge, a plate which supported numerous sharp spikes. The next noon the first "hand" failed to notice the innovation, and sat in the usual place with the result of torn trousers; this, it will be readily seen, increased production—for the tailor.

However this may be, in the course of time, this factory achieved a new superintendent, and after learning the ropes a little, one of the first things he did was to remove the spiked plate. He then set up a comfortable bench which the "hands" could occupy during their periods of relaxation.

Now I firmly believe, and I hope the editor will print what I write, that this little gracious act tended to increase the production of that factory: Anyhow, *something* had to pay for the nice little grass plot with flowers in the center, and surrounded by other benches which I noticed at my next visit to the place.

# SPECIAL AUTOMOTIVE



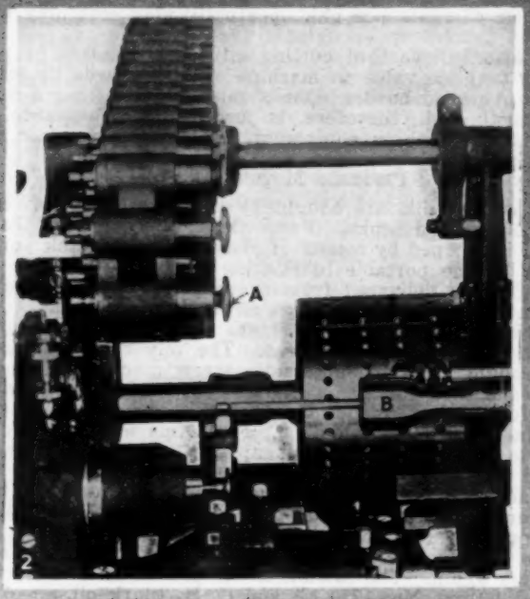



Fig. 1—Reed-Prentice four-way drilling machine operating on tractor differentials. The housings are centrally located and the four holes are drilled 90 deg. from each other. Time 1½ minutes. Fig. 2—Cleveland automatic screw machine with magazine feed turning valve heads. The magazine brings the valve *A* to the holder *B* which puts it in the chuck. Time 1 min. each.

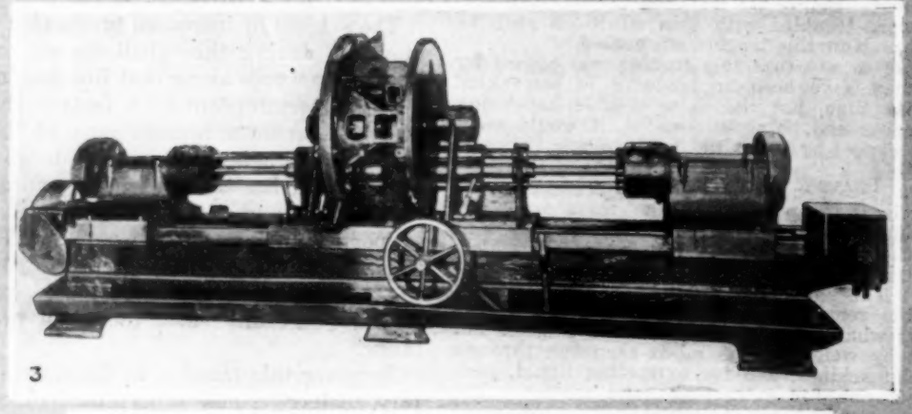


Fig. 3—Hoefer special machine drilling and reaming transmission cases. Tolerance 0.0005 in. on essential dimensions. Production time 4 min. from floor to floor.

# MACHINING METHODS

**Fig. 1—Newton special machine facing and turning the flanges of two oil pans bolted together. The cutter head revolves. Fig. 2—Newton special milling machine located on roller conveyor line. Work is clamped by screw *A*. The cutter head swings on column at right and the feed is by gear segment and pinion operated by the handwheel.**

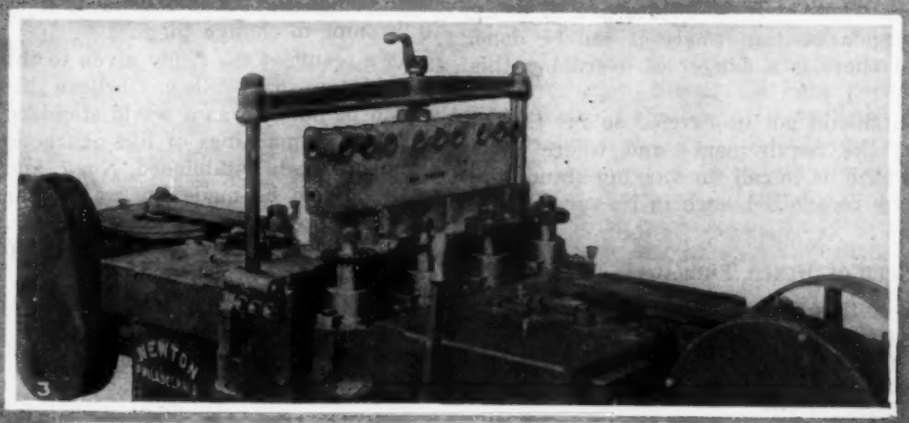



**Fig. 3—Newton eight-spindle machine facing bolt bosses on cylinder blocks. The cutter heads are operated by crank motion.**

# Standard Tapers

## A Statement of the Case for Existing Standards—Suitability of Tapers for Specific Jobs—Some of the Objections to the Jarno Taper

BY LUTHER D. BURLINGAME
Chairman, Joint Committee of A. S. M. E. and S. A. E. on Standardization and Unification of Screw Threads

A FERTILE field for investigation and discussion has been opened by the series of articles appearing in *American Machinist* under the heading "Shall We Standardize Tapers?" These articles give the opinions of fifty-eight manufacturers as to their present practice and recommendations for standardization and while it cannot be said that these fifty-eight manufacturers give quite "57 varieties" of opinion as to what should be done yet the great variety of opinions and the reasons given show the extreme difficulty in the way of finding a practical basis of standardization which would meet universal approval. In fact not only this series of articles giving such widely varying views but also an investigation which was made in 1918 with a view of establishing standards for large taper shanks and sockets and which was presented as a paper at the annual meeting of the A. S. M. E. in December of that year, lead me to believe that the greatest possibility of effective standardization will be by the adoption of at least *two standards for tapers* rather than by trying to bring all to a single standard, regardless of the needs, and regardless of what might result from the overthrow of basic standards so long recognized and so widely used.

I was much impressed with the point made by George E. Merryweather in his contribution on page 725, Vol. 56, of *American Machinist*, entitled "Shall We Standardize Machine Tools?" He shows the danger of jumping into such standardization without a conception of what it might mean, and of the results which would follow. I do not wish to be put in the position of not favoring standardization, as I am now working with several committees whose earnest efforts are to bring about practical standardization where it can be done, but I do feel that there is a danger of overdoing this matter.

Standardization should not be carried so far that it will fail to meet the requirements and where those requirements are such as to call for varying standards; they should be duly recognized, each in its turn becoming a standard.

### NEED OF FINER THREADS

An illustration of this is in the use of screw threads, where the attempt to hold all work to the United States standard screw thread, even though it is much too coarse for many uses has led to a great variety of finer threads being used because no standard for fine threads had been adopted. By frankly recognizing the need of finer threads and establishing a standard for them years ago this confusion would have been avoided, and two recognized standards would have been available, each useful for a particular field of work. The effort to bring this result about at this late date will eventually help the situation, but a far-seeing policy in the past by which at least two standards would have been recognized would have avoided the present confusion.

So it is with tapers. There are certain needs in which a taper as slight as $\frac{1}{2}$ inch to the foot is preferable to a steeper taper because it is desired to have tools, such as end mills, etc., drive in so as to hold firmly, and drive by the "bite" of the taper surfaces in contact; and to have this taper just such that even when driven in tightly it can be readily removed when tools are to be changed. One-half inch taper per foot meets these requirements.

On the other hand, there are needs, such as in drill presses and lathes, where the end pressure comes on the tool or center tending to crowd it more firmly into position and where a taper of approximately $\frac{5}{8}$ inch to the foot gives sufficient "bite" and allows for the tool or center to be more easily freed when a change is to be made.

### INTRODUCTION OF "MAGNUM" TAPERS

In cases of large tapers, where auxiliary driving means are required, and where the "bite" is not depended on for driving, but instead keys or clutches are used for this purpose, and where the parts are so heavy that greater difficulty might be experienced in removing them, a steeper taper still of $\frac{3}{4}$ inch to the foot is desirable. Such a standard has already been proposed under the name of "Magnum" tapers and is an extension of the B. & S. tapers to larger sizes than had previously been standardized.

These varying needs have led in the past to the establishment of several standards each of which is best suited to its particular use and two of which have become so widely used and so firmly established as basic standards that it is believed it would be a mistake to attempt to change them.

As a result of the study given to this matter, and for the reasons which follow, I believe that the Morse taper should be adopted as a world standard, for lathes, drill presses and machines of like character, up to the largest size already established, No. 7, and that the B. & S. taper, should be made the world standard for milling machines, gear cutting machines, etc.; the "Magnum" standard being used for all types of machines where still larger tapers are required.

That it is desirable to have more than one standard is voiced by a number of those replying to the *American Machinist* questionnaire.

For example, No. 7 says:

> The value of one standard taper is questionable because of the variety of uses to which taper shank tools are put. The Brown & Sharpe taper is unquestionably superior for milling machine work, because the greater the taper the easier it is to loosen the shank in socket, due to jarring in operation; but a greater taper is more satisfactory in drilling machines, and boring machines, on account of ease of extraction . . . . No great hardship would be noticed if the Brown & Sharpe taper were continued in use for milling machines, and the Morse taper adopted for other machine tools.

No. 22 says:

> Modern milling machines are equipped with Brown & Sharpe tapers; drill presses, radial drills and boring mills

with Morse tapers . . . . the Brown & Sharpe taper having a smaller included angle is better suited for milling machines, gear cutters or any type of machine, where a great side thrust is exerted. This side thrust has the tendency to cause the tapered end of the cutter arbor to work loose. The Brown & Sharpe taper has a greater frictional driving power than the Morse. . . . all our gear-cutting machines for the trade are equipped with Brown & Sharpe tapers. In our milling department we have adopted No. 11 and No. 14 Brown & Sharpe tapers as our standard.

No. 27 says:

For drill presses and lathe centers it seems there can be no objection to the Morse taper, but for milling machines we would prefer the Brown & Sharpe half-inch taper per foot.

No. 53 says:

We will be satisfied to use Brown & Sharpe tapers for our milling tools and Morse tapers on our drill presses.

A third standard which has come into use to some extent (the Jarno taper), while having advantages in the simple relations of its various dimensions has objections which it is believed would militate against its being adopted as a universal standard.

In the discussion referred to above, published in the *American Machinist*, while the Morse taper was given the preference if a single standard was to be adopted, and the B. & S. taper was generally preferred for milling and gear cutting machines, there seemed to be quite a leaning toward the Jarno taper.

### Origin of the Jarno Taper

This Jarno taper was first proposed by Oscar J. Beale of the Brown & Sharpe Manufacturing Co. in an article in *American Machinist* Oct. 31, 1889 and takes its name from the "pen name" under which Mr. Beale wrote. It is approximately the same taper per foot as the Morse taper, being a taper of 1 in 20, where the Morse taper is approximately 1 in 19½, and the B. & S. taper 1 in 24.

It is so close to the Morse taper that the fact that it has come somewhat into use is causing considerable confusion from the fact that it is not easy by inspection to determine which of the two tapers, Morse or Jarno, is used in a machine and the attempt to fit tools made to one of these tapers to machines having the other is a source of not only annoyance but of real loss. If it were not for the fact that the Morse taper, which approximates ⅝ in. to the foot, varies in nearly all its sizes from being exactly this taper, so that no two sizes are the same taper per foot, it would no doubt be more favorably considered as a standard; although this variation is not the practical objection which it appears in theory for gages once made will produce duplicate and thus interchangeable work.

Another objection to the Jarno taper is that the sizes vary uniformly by tenths of an inch in diameter at the small end. This has been pointed out by a number of those whose opinions are published in *American Machinist* as being an advantage. It is my belief, however, that it is not an advantage, but a serious objection to this system, as the proper requirements should grade the sizes of tapers in geometric progression from the smallest to the largest so that the larger sizes would be spaced much farther apart than the small sizes. See Fig. 1. I have pointed out the reasons for this in an article on "Geometric Progressions by Short-Cut Methods" on page 743, Vol. 56, of *American Machinist*.

For the same range which is covered by the Morse tapers in eight sizes the Jarno taper has 21, and this number of sizes would be increased to what would certainly be prohibitive if carried up to the sizes of the large taper shanks and sockets.

Another objection to the Jarno taper is that the formula is only applicable, as far as proportions of length to diameter go, to tapers of small or moderate size. As soon as large sized tapers are reached, such as say 4 in. in diameter, the Jarno formula would be entirely out of proportion, as it would call for a taper 20 in. in length, almost double that which good practice would require.

The correspondent of *American Machinist* No. 48, criticises the length of the Jarno taper even for the comparatively small sizes. He says: "In order to use a Jarno taper we have considered modifying the length, as there is no doubt that the general feeling exists that the Jarno taper is rather long."

Another reason, important from a practical standpoint, why the Jarno taper should not be used as a

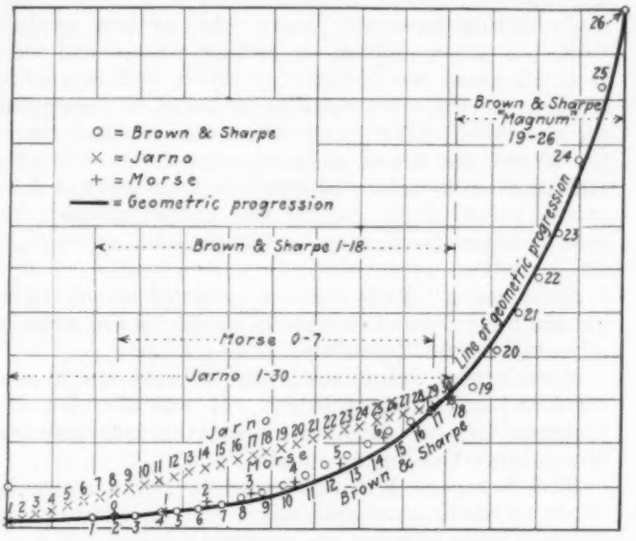



FIG. 1—TAPER SIZES IN RELATION TO A GEOMETRIC PROGRESSION CURVE

basis for a general standard to supplant the use of the Morse and B. & S. tapers now used, each in well-defined lines of machines, is that these latter standards are at present so extensively in use that great expense and confusion through a long period of years would be caused by attempting to make a change. Take the milling machine, for example, with its collets, arbors, shank cutters, etc., with vertical spindle and many other kinds or attachments now interchangeable not only with machines of the same make but also in various makes of machines. It is little realized through what a long period such a product must be interchangeable.

A short time ago, when the question of standards for tapers was raised as to whether they could be modified through a long period of years, an arbor with a taper shank was taken from stock and placed in the original universal milling machine built by J. R. Brown & Sharpe in 1861. It was found that the taper hole of the old machine was still standard after more than sixty years, so that the present day equipment would interchange.

Correspondent No. 40, after speaking of the many hundreds of thousands of machines in use, using tapers, says:

We should think it would be a very serious matter after so many years of having an established taper, such as the Morse taper, to consider making any change. From our own standpoint you can understand it would be a very

serious matter for us to consider, and we should hesitate about doing so.

No. 14 says:

If the Jarno taper were considered at the present time as the standard, there would be more opposition from the general public because it is little known, and this would require replacing the two well-known tapers, Brown & Sharpe and Morse.

Twenty-five years ago, there were many more tapers in use than at present, and the need for standardization was more apparent. Today the Brown & Sharpe and Morse tapers greatly predominate.

The records of our factory show that we have 721 machines with the Morse taper, 327 machines with the Brown & Sharpe, and 23 with the Jarno.

### Attitude of British Engineers

It is believed that what has been said regarding the American practice would also hold true of practice throughout the English-speaking world. The British Engineering Standards Association has given much study to this matter of tapers. As far back as July, 1918, the sub-committee on milling cutters and small tools discussed the question of tapers with a view of arriving at the most suitable standard to recommend for end mills. They recognized three accepted tapers, the Morse, the Brown & Sharpe and Jarno, and after consideration in detail the vote was unanimous in favor of the Brown & Sharpe for this particular use. The considerations leading up to this decision as given by the committee were:

*Jarno taper.* Difficulties in adoption owing to its present limited use, although its simplicity and practical advantages were appreciated.

*Morse taper.* Insufficient range of sizes, and in some cases lack of sufficient length. It was also felt that comparatively few machines were now being made with Morse taper hole in the spindle.

*B. & S. taper.* Was considered to offer a reasonable range of sizes, a suitable taper, and, in addition, had the advantage of being the standard generally in use.

In their published "Book of Standards for Milling Cutters and Reamers No. 122-1920," the British Engineering Standards Association gives data for and recognized both the Brown & Sharpe and Morse tapers to be used for shanks of end mills.

It is reported by Robert Grimshaw, in *American Machinist*, May 9, 1907, that the German manufacturers of twist drills meeting in Hanover declared that the proposed introduction into Germany of the metric taper, instead of being an advantage would be a disadvantage; that while these manufacturers realize that there were some variations in the Morse tapers, they claimed that this would not be a serious disadvantage to the use of that taper "because such tapers are not made according to measure but according to gages ground exactly to size, so that it makes no difference whether or not the measurements are in even millimeters or fractions thereof. . . . Twist drill manufacture has become a specialty; they are made in great quantities, and all dimensions are exact to the standards."

Mr. Grimshaw goes on further to say that from the German standpoint—

"There are further commercial reasons for keeping the Morse taper. Twist drills are a staple commercial article, price, dimensions and quality of which cannot be established by German makers. At present there are necessary a great number of special machines to make them. If it were required to bring out a metric taper it would be necessary to put in new special machinery specially therefor. Furthermore to double the amount of stock necessary to be kept by dealers would be a heavy burden. . . . The expense of such increased stock would have to be borne not only by manufacturers, but also by the dealers."

The question was raised with the Brown & Sharpe Manufacturing Co. by the British committee on cutters as to the arguments for having varying lengths of taper for a given size. They were answered, based on the experience at the Brown & Sharpe works in the following way:

"A reason for having several varying lengths is that in some cases the shank of the taper extends through the bearing for the spindle, so that the key for driving out the shanks will come back of the bearing. This necessitates a taper longer than would otherwise be required, an illustration being No. 10 used in milling machines with a depth of 5½ in. In other cases, where the taper is used in a collet, and it is desired to drive the shanks out without previously driving out the collet, it is necessary to have the keyway forward of the end of the spindle, or forward of the larger sized collets, and unless the taper holes are made shorter than standard, an excessive overhang results. For this reason shorter tapers are used in such places, so that it will be found that some are shorter and some longer than standard.

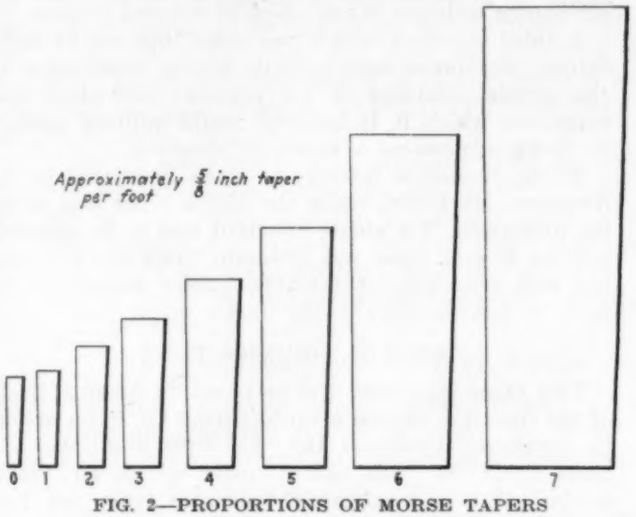



FIG. 2—PROPORTIONS OF MORSE TAPERS

MORSE AND BROWN & SHARPE TAPERS COMPARED

| Morse | | | | Brown & Sharpe | | | |
|---|---|---|---|---|---|---|---|
| No. | Taper Ft. | Diam. Small E | Depth Taper | No. | Taper Ft. | Diam. Small E | Depth Taper |
| | | | | 1 | 0.500 | 0.200 | ⅜ |
| 0 | 0.625 | 0.252 | 2 | 2 | 0.500 | 0.250 | 1 1/16 |
| | | | | 3 | 0.500 | 0.312 | 1⅛ |
| 1 | 0.600 | 0.369 | 2½ | 4 | 0.500 | 0.350 | 1 3/16 |
| | | | | 5 | 0.500 | 0.450 | 2 |
| 2 | 0.602 | 0.572 | 2 7/16 | 6 | 0.500 | 0.500 | 2⅛ |
| | | | | 7 | 0.500 | 0.600 | 2½ |
| 3 | 0.602 | 0.778 | 3 5/16 | 8 | 0.500 | 0.750 | 3 3/16 |
| | | | | 9 | 0.500 | 0.900 | 4 |
| 4 | 0.623 | 1.020 | 4 5/16 | 10 | 0.516 | 1.045 | 5 |
| | | | | 11 | 0.500 | 1.250 | 5 1/16 |
| 5 | 0.630 | 1.475 | 5 5/16 | 12 | 0.500 | 1.500 | 7 |
| | | | | 13 | 0.500 | 1.750 | 7 |
| | | | | 14 | 0.500 | 2.00 | 8 |
| 6 | 0.626 | 2.116 | 7½ | 15 | 0.500 | 2.25 | 8 |
| | | | | 16 | 0.500 | 2.50 | 9 |
| 7 | 0.625 | 2.750 | 10 | 17 | 0.500 | 2.75 | 9 |
| | | | | 18 | 0.500 | 3.00 | 10 |

B. & S. "Magnum"

| No. | Taper Ft. | Diam. Small E | Depth Taper |
|---|---|---|---|
| 19 | 0.750 | 3.25 | 12 |
| 20 | 0.750 | 4.125 | 14 |
| 21 | 0.750 | 5.00 | 16 |
| 22 | 0.750 | 5.875 | 18 |
| 23 | 0.750 | 6.75 | 20 |
| 24 | 0.750 | 8.50 | 24 |
| 25 | 0.750 | 10.25 | 28 |
| 26 | 0.750 | 12.00 | 32 |

"Morse" recommended as World Standard for Lathes, Boring mills, drill Presses, etc.]

"B. & S." recommended as World Standard for Milling Machines, Gear Cutting Machines, etc.

"Magnum" recommended as World Standard for all cases where large sizes are required.

"Where no such limiting conditions exist, it is intended to have the lengths of tapers made standard."

The variation of some of the Morse tapers and of the No. 10 Brown & Sharpe taper from a taper uniform with the remainder of the series was challenged by C. Franklin Rothera in *American Machinist*, page 893, Vol. 56, where he speaks of the difficulty of answering the queries of his pupils as to the reasons for these variations of tapers, he considering that these variations are an important reason for bringing about a change.

### Difficulty of Changing Now

This question was also raised by the above-mentioned British committee as to whether a change could be made in the Brown & Sharpe No. 10 taper so that it would in future be made exactly ½ in. taper per foot. They were answered in this way:

The No. 10 Taper was no doubt originally intended to be ½ inch per foot but in the early days, before measuring tools of precision were available, before the importance of standardization was realized, and after Brown & Sharpe had adopted this taper from others who had begun to use it, this standard became so firmly established that when it was known that it was not of an even ½-in. taper to the foot it was thought best to perpetuate the variation rather than to become involved in the difficulty of making a change.

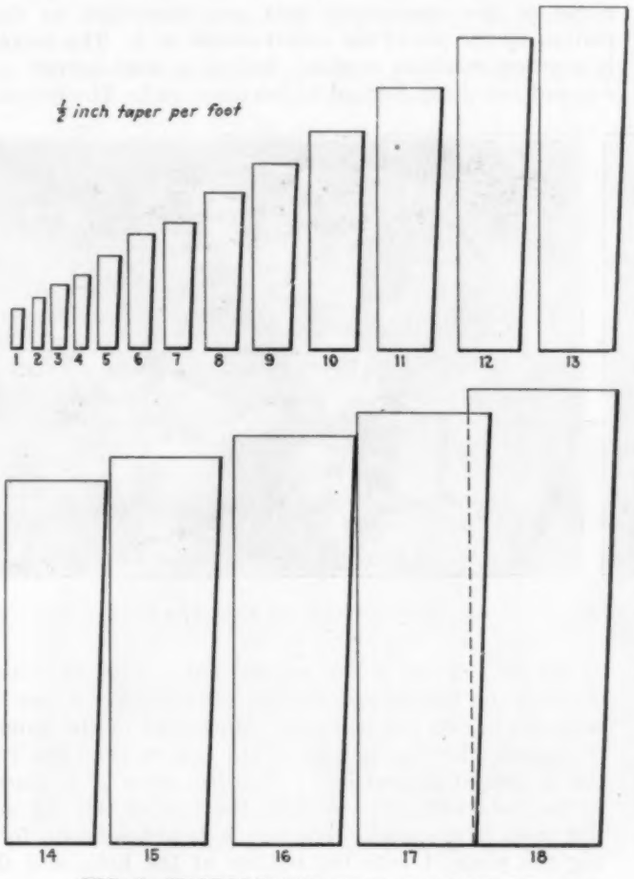



FIG. 3—PROPORTIONS OF B & S TAPERS

This difficulty of making a change applies in a still greater degree at the present time, there now being hundreds of thousands of machines and attachments having this taper and many times that number of arbors, end mills and other tools which fit the taper holes, besides the equipment of gages found in every manufactory where these tapers are produced, both in America and abroad.

The change from 0.5161 to 0.5 per foot would be so great that the parts would not practically interchange, that is, an end mill or arbor made to the new standard could not be satisfactorily used in a spindle or collet of the old standard. At the same time they would be so nearly alike that it would be difficult to detect the difference by inspection, and through a long period of time this would cause great annoyance and expense, besides bringing serious criticism upon the manufacturers on the ground that their work was not being accurately made.

If this were changed the new standard would not be the Brown & Sharpe taper which through a period of sixty years' use we feel has become so established and so widely used as to make us in a sense custodians for its preservation.

The comparative sizes of the Morse and Brown & Sharpe tapers are indicated in Figs. 2 and 3 where each size is shown to a scale of approximately one-half full size, the sizes including the "Magnum Tapers" being given in the accompanying table, Fig. 4.

For any who are interested in a more complete study of the origin and development of the different standards for tapers and the principles on which tapers depend, reference may be made to the article, "Standards for Large Taper Shanks and Sockets" by the author, reprinted on page 537, Vol. 50, of *American Machinist*.

### Now is the Time

It is felt that all the information it is possible to give regarding tapers should be brought to the front at this time, as there is a joint committee of the American Society of Mechanical Engineers and the National Machine Tool Builders' Association working on standardization. The matter of tapers is one of the subjects to have attention by the committee.

Charles le Maistre, secretary of the British Engineering Standards Association, who is working in close co-operation with American interests looking toward standardization, while speaking at a recent meeting of the North East Coast Institution of Engineers and Shipbuilders held at Newcastle-upon-Tyne said, regarding the general principles underlying standardization: "Industrial standardization does not necessarily involve the idea of actual perfection; it is rather the registering of what is best in present practice as against attempting to set up an ideal. It is quite easy to set up a standard, but it is altogether another thing to get that standard widely adopted, and a standard which is not in accordance with the fundamental needs of industry, that is, which does not fulfill a recognized want is economically a bad one. It is a wasted effort and a pitfall for the unwary."

It is believed that applying this sound advice, based on most extended experience in standardization, to the question of tapers will lead to the recognition as standard of the two tapers here advocated, namely the Morse and the Brown & Sharpe.

## Awakening the Worker's Interest

By Robert Grimshaw

A foreman's first step in awakening interest on the part of the worker is to have it himself. Next, he should prove that he has it by manifesting it. To be interested merely in the product is not, in itself, sufficient. He must be interested also in the means of making it and, above all, he must impart this interest to the operatives to whom he entrusts the carrying out of his orders or the orders of his superiors transmitted through him.

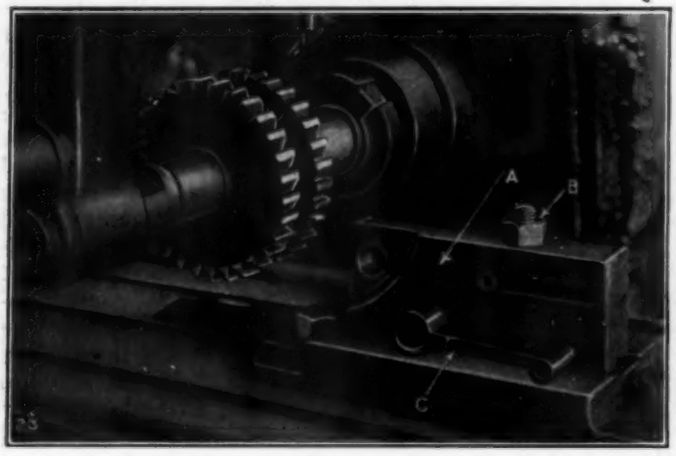
Interest is like magnetism—it can be imparted. True enough, its degree and permanence vary with the material magnetized, but as the choice of the human material usually rests very largely with the foreman, he can seldom complain if he gets poor results.

# Machining and Assembling Operations on Pneumatic Tools

## The Third of Four Articles—Milling and Grinding Operations on Connecting Rods for Air Motors—A Ball-and-Socket Joint—Swaging and Milling

By HOWARD CAMPBELL
Western editor, *American Machinist*

THE Independent Pneumatic Tool Co. has developed, for use in the air motor, a connecting rod that is formed from heavy sheet metal. There are several machining operations after the forming operation, one of which is that of straddle-milling the large end. This operation is illustrated in Fig. 23. That part of the fixture which holds the rod consists of a rectangular block standing on its side, as shown. The block has a slot in which the rod is located for milling, as shown at *A*. The slot and holes for the small and large ends of the rod are just large enough so that when the nut *B* is loosened, the rod can be slipped in and out of the fixture. Tightening the nut B clamps the rod in place, as shown. A finished rod is shown at *C*.



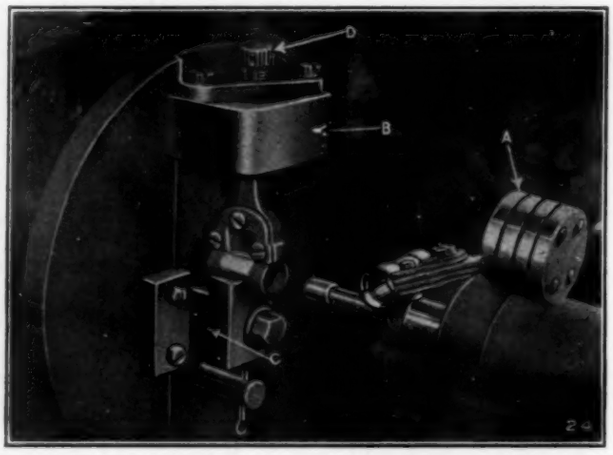




FIG. 23—MILLING AIR-MOTOR CONNECTING RODS. FIG. 24—GRINDING THE CRANK BEARING IN A CONNECTING ROD

The set-up for grinding the crankshaft bearing in a new style inner rod is shown in Fig. 24. This operation is performed after the rod and piston are assembled, as shown at *A*, to insure that the ground hole will be square with the piston. A hole is bored in the block *B* so that when the assembly is placed in the fixture, the piston slips into the hole and the bearings rest in the V-block *C*. The assembly is held in place by screwing the setscrew *D* down onto the piston. The machine is a Bryant chucking grinder.

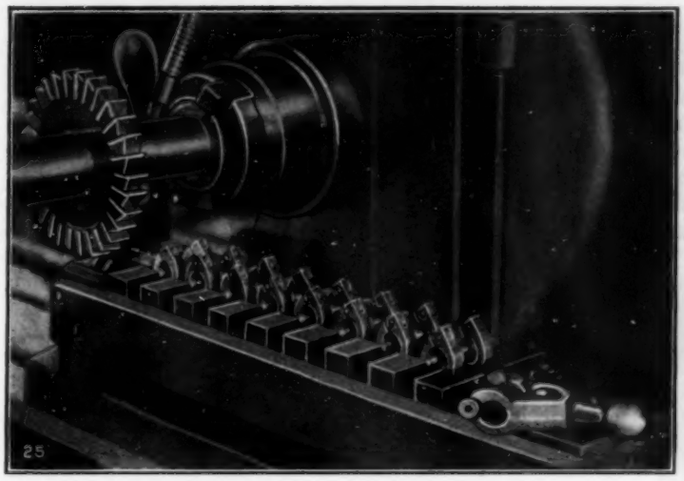
The fixture used in gang-milling the inside faces of a number of old-style rods can be seen in Fig. 25. The rods, one of which is seen lying on the fixture, are placed between the blocks with the ball ends down. Pressure is brought to bear against the first block by the action of a large screw in the end of the fixture, and as this screw is tightened, the pressure is distributed so that it holds all the blocks and pieces firmly in position. Heavy springs between the blocks tend to spread them when the pressure is relieved, thus assisting the operator in removing the pieces.

The fixture used for straddle milling the sides of another kind of rod is illustrated in Fig. 26. One of the rods is lying on the top of the fixture at *A*. The rod is held in the fixture at *B*. The block *C*, which is hinged at the bottom, is swung up against the rod and the clamp *D* is swung over so that the setscrew *E* can be tightened against the back of the block *C*, thus holding the rod rigidly in place. The cutters straddle block *C* and mill the sides of the rod.

A unique punch press operation is shown in Fig. 27. Some of the connecting rods are assembled to the pistons by the use of the socket shown at *A*. The socket is a screw machine product, having a stud turned on one end and a cup formed in the other end. The bottom of the hole *B* has a full radius, and a hole is drilled through the bottom so that the connecting rod can be suspended from the ball end. Movement of the handle *C* spreads the two halves of the die so that the rod can be placed in position. Then the piece *A* is placed in the hole with the cup over the ball of the rod and the press is operated. The punch *D* comes down, forcing the piece *A* into the bottom of the hole, and the shell of the cup is closed around the ball, forming a ball and socket joint. Both of the handles *E* have to be pressed down by the operator before the clutch of the machine can engage, making it impossible for the operator to have his hand under the ram while the machine is in motion.

After the rod and socket have been joined, the stud on the upper end of the socket is screwed into a tapped hole in the center of the piston head, from the inside, of course, and a nut is screwed on. The end of the stud is then peened over the nut so that the stud cannot work loose.

The set-up of a double head Hartness flat turret lathe for machining ratchet levers is illustrated in Fig. 28. Two pieces are bored and faced at the same time. the bore being held to a limit of 0.002 in. The produc-



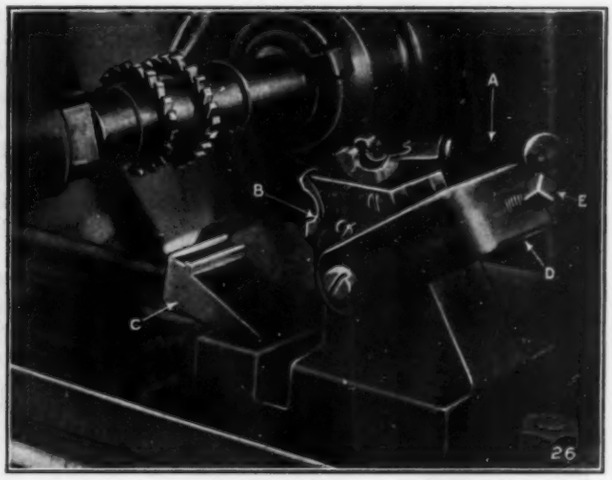




FIG. 25—MILLING INSIDE FACES ON CONNECTING-ROD BEARINGS. FIG. 26—STRADDLE-MILLING A CONNECTING ROD

tion of this machine is an average of 70 pieces in nine hours.

Another punch press operation is that of forming the dividing collar as shown in Fig. 29. The collar is made from No. 11 gage (0.120 in.) sheet steel stock, dead soft. This is cut to strips $\frac{13}{32}$ in. wide and $4\frac{7}{8}$ in. long in a previous operation. In the present operation the piece *H* is laid in the groove between the two pins *A*. The operation of the press causes the punch *B* to press the stock down on the bar *C* which also descends, as it is held in the position shown by strong springs. While this is taking place the blocks *D* and *E* are being pushed together by the action of the pieces *F* and *G*, thus forming the strip into the circular piece shown at

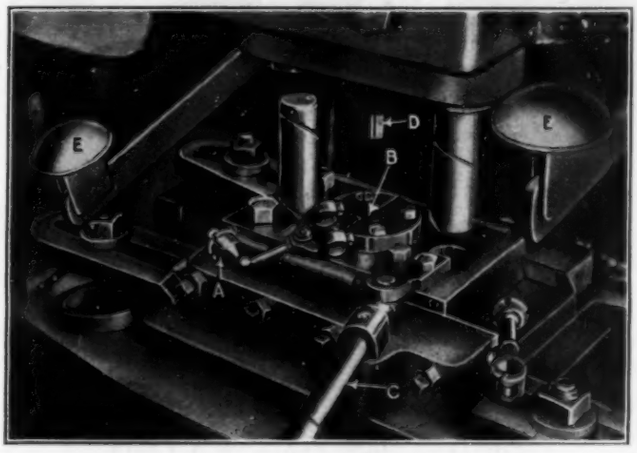



FIG. 27—FORMING A BALL-AND-SOCKET JOINT

*H*. As the ram ascends, the springs which can be seen in the illustration draw the blocks *D* and *E* back into the original position, releasing the piece. The radius in the top of the bar *C* conforms to that in the blocks *D* and *E*, so that the piece will be formed in a circle.

A simple, though interesting, operation can be seen in Fig. 30—that of milling the grooves in the live air handle sleeve. Although three cutters are used in this operation, only one groove is finished at a cut. The central cutter, which is a little smaller in diameter than the other two, mills the bottom of the groove, while the other cutters mill alternate sides of the two grooves to the right and left of the center groove. A finished handle can be seen standing on the table of the machine beside a handle in which the grooves have not yet been cut. The sleeve is mounted on a mandrel held between the dividing head center and the dead center.

The illustration, Fig. 31, is that of swaging the hole in a pinion gear, which is done in such a manner as to leave a key. A broaching operation precedes swaging.

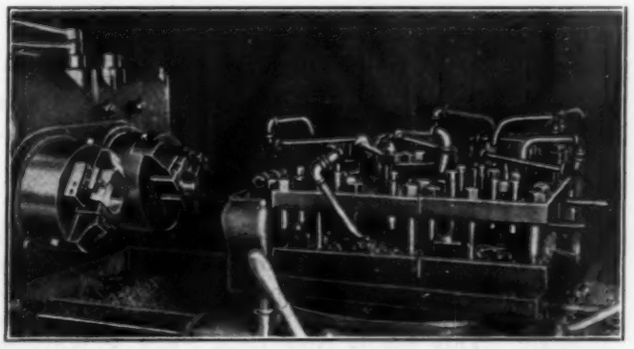


FIG. 28—USING THE DOUBLE-SPINDLE HARTNESS FLAT TURRET LATHE

The gear blank is 1.100 in. O.D. and 0.6562 in. long. A $\frac{1}{2}$-in. hole is drilled to admit the broach. The broaching operation leaves the hole 0.515 in. in diameter, with a key 0.060 in. high and tapered on each side 19 deg., or 38 deg. included angle. The broach is $25\frac{3}{4}$ in. long, on which the teeth occupy $19\frac{1}{8}$ in., leaving a plain end or

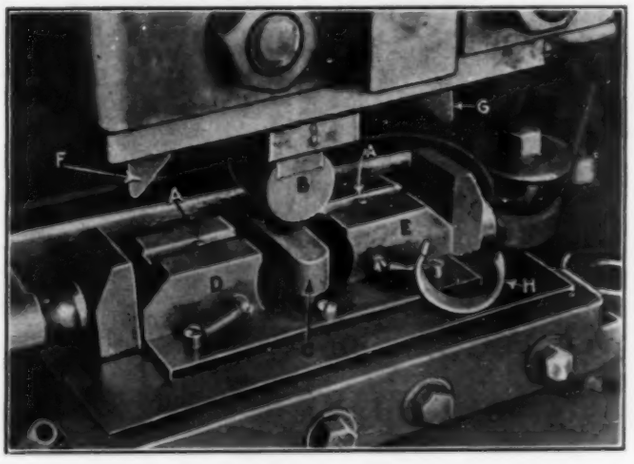



FIG. 29—FORMING A DIVIDING COLLAR

guide of 6⅜ in. The first tooth of the broach is 0.395 in. high and the last three teeth are 0.515 in. high.

The swage, which is shown in position in Fig. 31, is 7 ½ in. long, 0.512 in. in diameter at the bottom end, and 0.520 in. in diameter just below the groove indicated at *A*. That part of the swage from the groove to the upper end is approximately ⅓ in. under size, which allows the swage to pass through the piece without sticking. The pinion locates in a recess in the collar

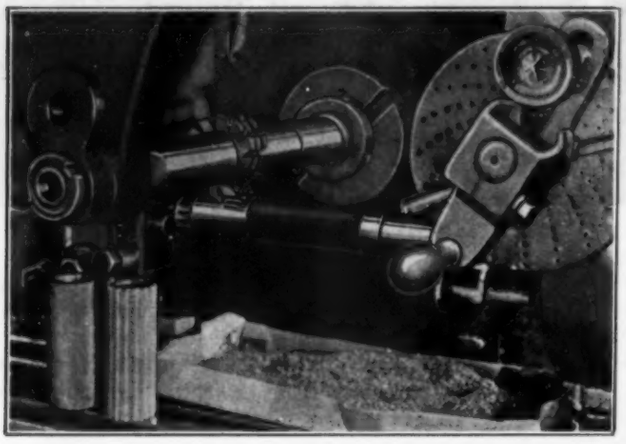


FIG. 30—MILLING THE GROOVES IN AN AIR-DRILL HANDLE

*B*. The lower end of the swage, being a couple of thousandths smaller than the hole, can be inserted into the pinion and the upper end centers into the sleeve *C*. This tool leaves both hole and key the correct size.

### Using the Duplex Milling Machine

Another milling operation is that of milling the "tang slot" in an air drill sleeve, Fig. 32. The fixture consists of a V-block and clamp as shown, and the milling is done with two end mills that operate simultaneously. This job is done on a Pratt & Whitney duplex milling machine similar to that used for milling the slots in the roller cage, Fig. 19. Slots are milled on

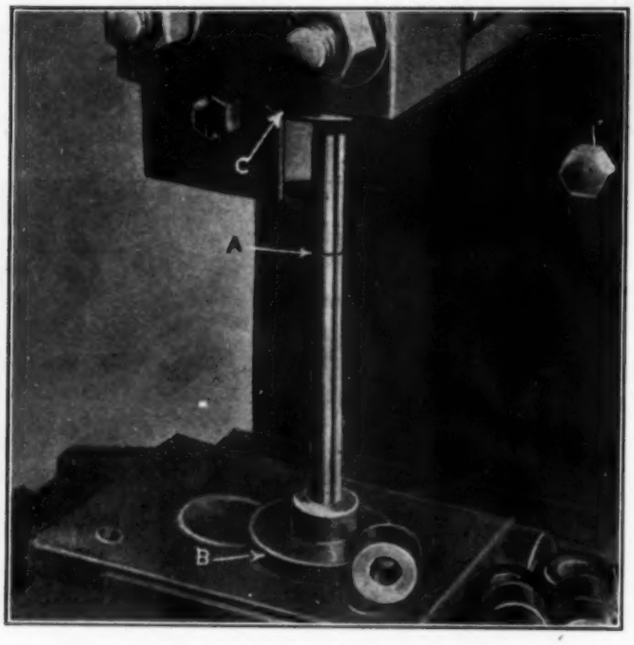



FIG. 31—SWAGING THE HOLE IN PINION BLANK

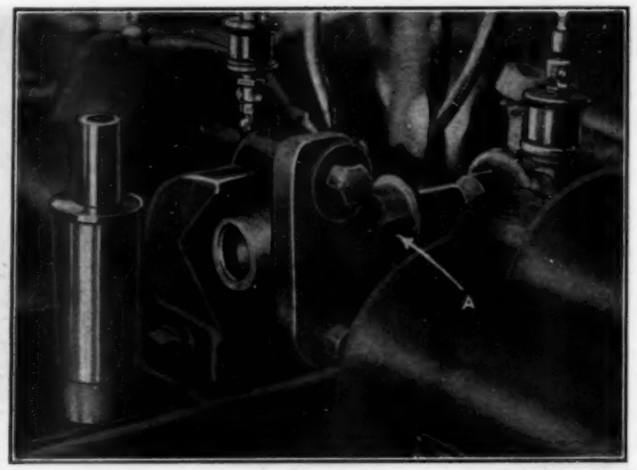



FIG. 32—MILLING THE "TANG SLOT" IN A DRILL SLEEVE

both sides of the piece simultaneously, the table traveling back and forth the length of the slot while the two cutters are gradually being fed into the piece. After the slot has been milled through, the cutters automatically withdraw and the machine stops. An unfinished piece is shown standing on the table of the machine.

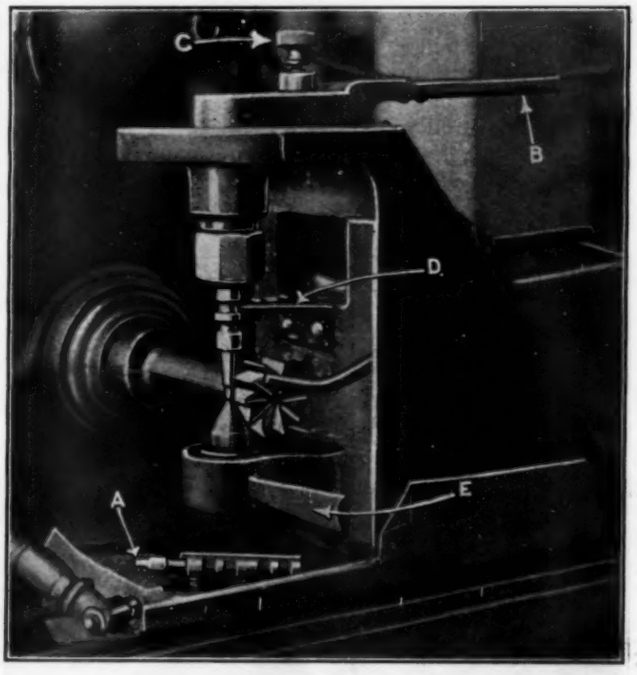



FIG. 33—MILLING FLATS ON A VALVE

The operation shown in Fig. 33 is that of milling two flat spots on opposite sides of the end of a valve, a finished example of which is shown at *A*. The lower end of the valve is held on a center and the upper end is held in a collet chuck which swings with the handle *B*. Two holes are provided in the upper face of the fixture, one being on either side of the axis of the handle, into which the spring-pin *C* fits, to insure the valve being swung 180 deg. between cuts. The stop *D* is provided so that the valve will be chucked in the correct position, and the lower center, which rests on a strong spring, can be withdrawn by the handle *E* to allow the pieces to be changed.

# Methods of Machine Tool Design

## Continuation of the Fifth Section—Effect of Feed Requirements on the Design—Solution of Problem on Designing Gear Drive for Heavy Lathe

By A. L. DeLEEUW
Consulting Editor, *American Machinist*

WHEN the amount of feed pressure has once been determined, it becomes possible to make a fairly close estimate of the amount of power required for the feed. In order to do so, it is necessary to lay out the general scheme of the feed mechanism. As a rule, this is possible because we have, at that time, a general idea of the construction of the machine to be designed and, though we may not be able to lay out the feed mechanism in all its details, we can develop a diagram which will show practically all the essential elements.

For instance, if we were designing a very heavy lathe in which the carriage is pulled by means of a heavy lead screw centrally located in the bed, we would know at once that there would be a gear at the end of the spindle or of some shaft of which the speed bears a constant relation to the speed of the spindle; we would have two studs on which change gears would be located and we would have perhaps one or two sets of transmission gears in order to reach the lead screw. After this we would have to consider the lead screw itself with its thrust bearings. Knowing the feed pressure and the approximate size of the lead screw, we can figure out the efficiency of the screw as well as the efficiency of the sets of gears which we have imagined. In this manner we can calculate the total amount of power required for this mechanism, and, though we are not absolutely sure as to the actual number of gears to be employed nor of the exact elements of the screw or its thrust bearing, we will come close enough for an estimate of the amount of power required.

In the foregoing calculation we started out with the amount of feed pressure and, as was mentioned before, this is the same as the pressure at the tool point. Designing this lathe, we must have had in mind on what size work this heaviest tool pressure might be required. Suppose the lathe to be a 48-in. machine, and that the kind of work for which it is intended requires the heaviest pressures at a diameter of 16-in. Then we know that the greatest amount of power will be used when we are working on this 16-in. job; but this does not necessarily mean that we will also have the maximum pressure on the face gear. It might be, for instance, that the cuts taken on a 32-in. piece will be less than that on the 16-in. piece, but more than half as much; in which case the pressure on the face gear teeth would be greater with the 32-in. than with the 16-in. job, though the amount of power required would be less. It is therefore necessary to analyze carefully the different kinds of jobs which may be put on such a lathe, and find both the maximum power as well as the maximum pressure on the faceplate.

To illustrate the foregoing, we will take a concrete example. We will imagine a lathe of 48-in. swing, of which the most important work will be the work of turning up 16-in. cast-steel rolls, but which will be required also to turn up larger work, such as shells or sleeves, rings, etc. We are informed that a large amount of metal will have to be removed from these rolls because the castings cannot be expected to come very uniform or close to size. We are also informed that practically all of the other work to be done on this machine will be on forgings which will come fairly close to size, and furthermore, that the percentage of this second kind of work is rather small so that, even if we could not always take the full cut at once, the total efficiency of the machine would not be very much reduced.

We will figure, then, on a maximum cut on the 16-in. work of $\frac{1}{4}$ x $\frac{1}{8}$ in., requiring a tool pressure of 30,000 lb. and at a speed of 45 ft. per minute, thus requiring 1,350,000 ft.-lb. per minute. On the other hand, with the larger work, we will be satisfied with a cut of $\frac{1}{4}$ x $\frac{1}{32}$ in, thus requiring a pressure on the tool of 22,500 lb., and a power of practically 1,000,000 ft.-lb.

We see, then, that the power required for the large work is less than that required for the small work. If the face gear has a diameter of 40 in., then the pressure required for the small work will be $\frac{16}{40} \times 30{,}000$ lb. $= 12{,}000$ lb., while that required for the large work is $\frac{32}{40} \times 22{,}500$ lb. $= 18{,}000$ lb. We see, then, that the pressure on the faceplate is greater when the lighter work is done.

When we know the different speeds at which we wish to run the lathe, and the power required at various speeds, we can develop the gear mechanism for the drive. It will be assumed here that the reader has the full knowledge required for the selection of gears of the proper size, shafts of the proper diameter, etc., but we will show here how to determine the loads which may come on each of these gears or shafts. We will further assume that a gear arrangement of the general style as indicated in Fig. 16-D will be used, and that the speeds will range from 4.5 to 230 r.p.m. We will find that the speeds will be the following: 4.5—5.85—7.60—9.89—12.85—16.71—21.72—28.24—36.71—47.72—62.04—80.65—104.85—136-38—177.2—230.4. In Fig. 68 this gear arrangement is shown with the various gears marked *A*, *B*, *C*, *D* and so on.

### A Simple Lathe Gear Drive

The arrangement of Fig. 68 is shown here as an illustration, not because it is particularly adapted to a lathe drive which, as a matter of fact, it is not, but because it avoids a number of the complications which would occur in most drives actually used for such a purpose, so that the problem is simplified and lends itself better to our purpose.

The drive is supposed to be by means of a tumbler arrangement of which the driving pinion is *A* and the cone of gears *B*, *C*, *D* and *E*. As a matter of fact, we would probably use sliding gears instead of this tumbler arrangement. After the tumbler, we double the num-

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ber of speeds by means of the sliding gears *F*, *G*, *H* and *J*; and after this, we again double the number of gears by means of the peculiarly arranged back gears *K*, *L*, *M* and *N*. In this arrangement the gears *G* and *J*, as well as the pinion *K*, are mounted on a sleeve which turns on the spindle.

If we do not desire such a sleeve arrangement, we can mount these gears on a separate shaft, but in that

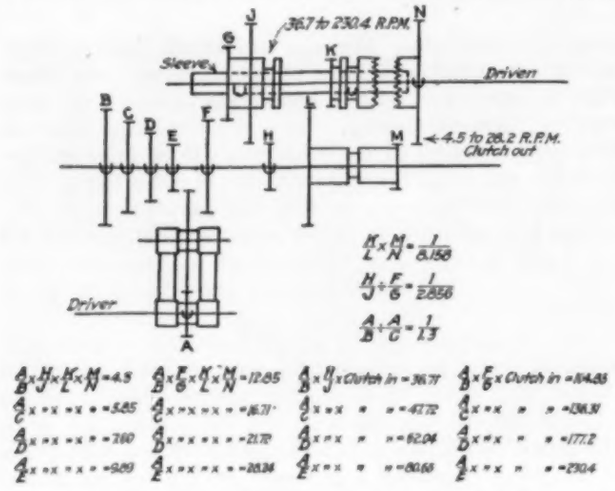



FIG. 68—DIAGRAM OF LATHE GEAR DRIVE

case, we would have to drive from this shaft to the spindle for a final transmission. The back gear arrangement is so constructed that a single lever movement will bring *K* in mesh with *L* and at the same time *M* with *N*; and that the movement of this lever in the opposite direction will disengage *M* and *L* from *N* and *K* while a continuation of this movement will clutch pinion *K* to face gear *M*.

The lowest range of speeds will be obtained with the back gear *K-L-M-N*, with *H* engaging *J*, and with *A* driving *B*, *C*, *D* or *E*. Under those conditions the speeds range from 4.5 to 9.89 r.p.m. Under the con-

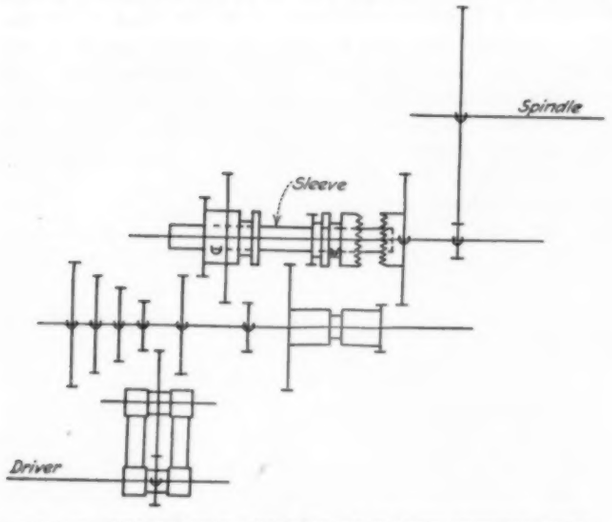



FIG. 69—DIAGRAM OF MODIFIED DRIVE WHICH USES SMALLER GEARS

ditions of the example we selected, that is, doing the heaviest work on a diameter of 16 in., we will have to use the full power of the machine at a speed of 11 r.p.m. (which gives a speed of 45 r.p.m. on a diameter of 16 in.). We find in the tabulation of Fig. 68 that there is no speed of 11 r.p.m., so that we must choose either 9.89 or 12.85; and as we do not dare to use a speed higher than 45 ft. per minute, we are compelled to run at 9.89 r.p.m. We find, then, that gear *N* must transmit the full power of the machine at 9.89 r.p.m., and we can easily work back and find the pressure from the teeth of gears *M*, *L* and *K*. Knowing the relative size of gears *J* and *K* we can also figure out what pressure would come on the teeth of gear *J*.

At a first glance it would seem that the pressure on the teeth of gear *G* would be greater than on that of gear *J*, because its diameter is smaller. However, we notice that *J* is driven by *H*, and *G* is driven by *F*, and that *F* is larger than *H*, and therefore runs at a higher circumferential speed; so that *G* also must run at a higher circumferential speed than *J*, and consequently its tooth pressure must be less.

Furthermore, we notice that the speed which we require for 32-in. work is 22 r.p.m.; so that we select the speed which, in the tabulation, is marked 21.72. This speed is obtained when *F* meshes with *G*, and we found that only three-fourths of the total power is required

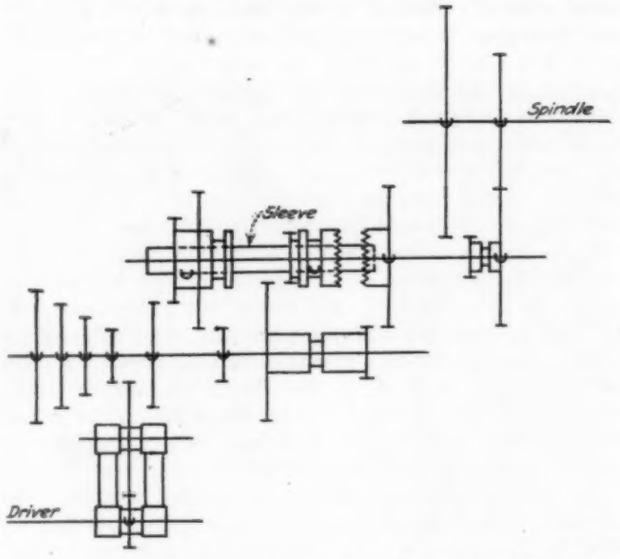



FIG. 70—FURTHER MODIFICATION OF LATHE DRIVE

for this work; so that not only is the tooth pressure on *G* less on account of its higher speed, but also because only three-fourths of the horsepower is employed.

In the design of commercial machines where nothing is known as to the nature of the work to be done on them, such analysis is not always possible, at least not when we have to consider the amount of horsepower actually needed for the work. However, we can always compare the circumferential speed of the various gears in action and, in that way, determine the maximum amount of tooth pressure which must be provided for.

In special machines where, as a rule, we know the kind of work which must be done, we can follow the entire analysis and study every gear and shaft from the standpoint of the work it is called upon to do.

## Gear Speeds

Next in importance to the load on the gears is the speed at which they are to run. It is desirable to keep this speed down to as low a point as possible and to do it by keeping the diameter of the gear down rather than the number of revolutions. If, in the drive of Fig. 68,

we should consider the last shaft not as the spindle but as a shaft which drives the spindle in its turn, we would have been able to reduce the dimension of the entire drive. Fig. 69 shows such an arrangement. The entire drive, with the exception of the last gear, is separated from the spindle, so that it is possible to

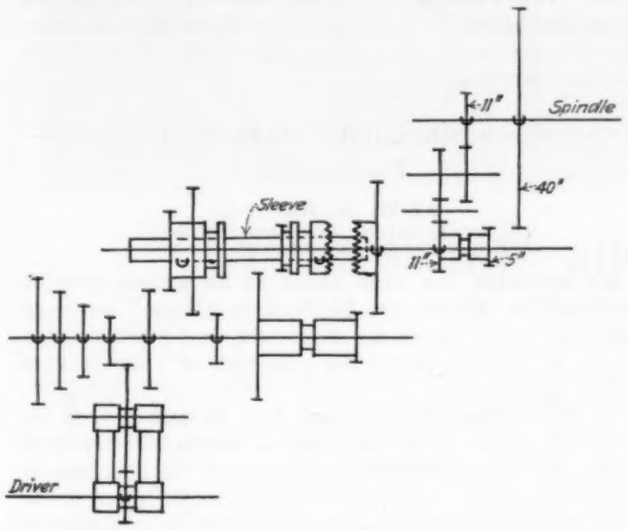



FIG. 71—ANOTHER MODIFICATION OF LATHE DRIVE

run all the gears of the drive at a much higher speed and consequently reduce their size. The advantages of such a scheme are that the entire drive can be built up in a unit which may be used for more than one style or size of machine, thus making a true manufacturing proposition; and that all the gears with the exception of the last one can be kept small.

However, we will have to check up and see whether some new element has crept in which may cause trouble. We see right away that the large gear on the spindle must run from 4½ to 230 r.p.m., and that this gear must be kept down in size if we do not wish to exceed a speed of, say, 700 ft. per minute. At that speed the gear could not be more than 11¾ in. in diameter, and this, of course, is too small for the machine we have in mind. If we wish to make this gear about 40 in. in diameter, we must not run it more than 67 r.p.m. In order, then, to obtain all higher speeds, we must have an additional means of driving from the last shaft to spindle. Such an arrangement is shown in Fig. 70. The last two gears of the last driving shaft are so arranged that they can slide either in contact with the large or the small gear on the spindle. Our arrangement is now such that we can use a 40-in. gear for the heavy drive and a gear of about 11 in. in diameter for the lighter and high-speed drives.

Having looked at this matter in a general way, we must now look at it from the standpoint of details to see whether some new element has crept in which may cause trouble.

If we should have a pinion of, say, 5 in. in diameter driving the face gear, then the sum of the diameters of these two gears would be 45 in., and therefore, the sum of the diameters of any two other gears acting between these same two shafts must also be 45 in. And as the small gear on the spindle cannot be more than 11 in. in diameter, we find that the gear which drives it must be 36 in. in diameter. Not only would such a gear be very clumsy, but it would mean that we speed up from the last driving shaft to the spindle more than 3 to 1, so that our driving unit, which was supposed to run at high speed, will actually have to run at a very low speed, namely, less than ½ of 230 revolutions.

An attempt to overcome this difficulty is shown in Fig. 71. It would not be necessary for the designer to re-copy the major part of the gear arrangement as

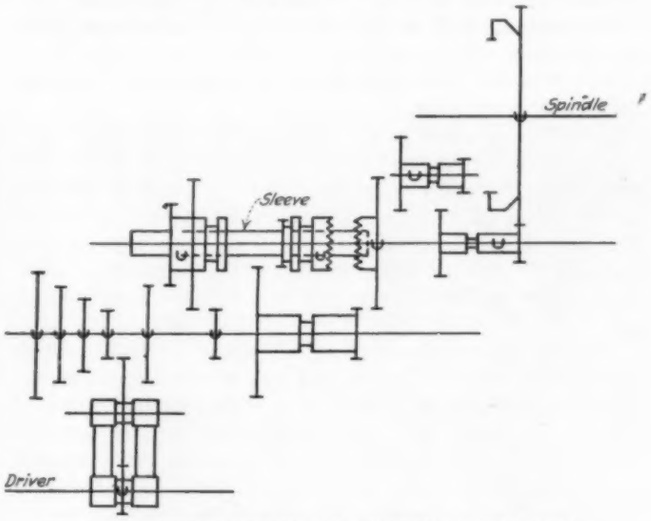



FIG. 72—INTRODUCTION OF INTERNAL GEARING

we are only concerned with the last few gears. On the other hand, it is so easy to make such a sketch that it is well to make every sketch complete so as to be able to keep them on record, in order to show at any later time the steps which have been followed in trying to obtain a solution.

In this Fig. 71 we drive from the last driving shaft

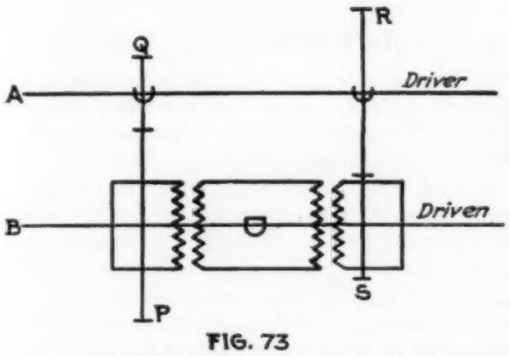



FIG. 73

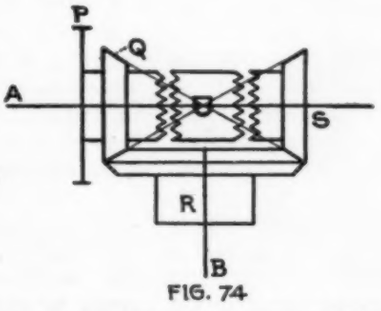



FIG. 74

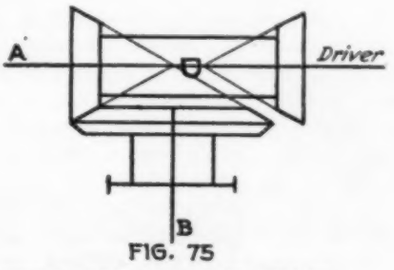



FIG. 75

FIG. 73—SPUR DRIVE WITH IDLE RUNNING GEARS. FIG. 74—BEVEL DRIVE WITH IDLE RUNNING GEARS. FIG. 75—BEVEL DRIVE WITH NO IDLE RUNNING GEARS

to the spindle, either by means of one pair of gears, 40 in. and 5 in. respectively, or else by means of two gears each one 11 in., and some compound gearing between. The ratio between these two drives is 8 to 1, so that, if we have the lowest possible speed, namely 4½ revolutions, when the 5-in. pinion engages the 40-in. gear, we will have 36 revolutions when we use the other set of gears. This function of making a shift of 4½ to 36 r.p.m. is the function of gears *K*, *L*, *M* and *N*, so that, if we should use this new arrangement, we might omit these gears.

After we have found that our proposed arrangement will give us the proper speed, we next examine the direction, and we find that unless we put an idler in the compound gearing the spindle would run in opposite directions when we use one or the other set of gears. This use of an idler is not a desirable thing. For this reason we make another attempt such as is shown in Fig. 72, where the proper direction is restored by making one pinion act on an external gear whereas the other meshes with an internal gear.

It was the writer's intention to bring out the fact that in an attempt to design a set of gears we should look successively at: (1) The load; (2) the speed; (3) the direction. And we should not try to solve more than one problem at a time.

The designer should at all times keep before him the following requirements:

(1) Every gear must have sufficient strength to carry the greatest load that may come on it under any condition of running the machine. Though a certain combination of gears may not be intended for use in the actual running of the machine, so long as the operator is able to effect such a combination, the gear must be of sufficient strength to carry the corresponding load.

(2) No gear must run at a higher circumferential speed than what is proper for the material and workmanship of the gear. There is a wide possible range of running speeds. Whereas cast gears (which are no longer used in the construction of machine tools) should not run at more than 500 ft. when used in a machine shop, herringbone gears, carefully cut, running in oil in a closed frame, may run 2,000 ft. or more, and rawhide gears, fabroil, or bakelite micarta gears may run as high as 2,700 or 2,800 feet.

(3) All idle running gears should be avoided. When speaking of idle running gears we do not mean the gears of a set of sliding gears which are not engaged, nor those of a cone of gears which do not mesh with the tumbler, but gears which are actually meshed with some other gear, though not transmitting power. Fig. 73 shows an arrangement in which such idle gears are used.

The illustration shows *A* as the driving shaft. The same arrangement is sometimes used with *B* as driver, which makes the faulty condition even worse. If the clutch should be connected to gear *P*, then shaft *A* would be running at a higher speed than shaft *B* and gear *S* at a still higher speed. If a construction such as shown in Fig. 73 must be used, then the shaft containing the clutch should be made the driven shaft. Constructions of this kind are particularly objectionable on account of the difficulties of lubrication. This matter will be discussed more in detail later on.

It is sometimes very difficult to avoid idle running gears. The bevel gear reverse shown in Fig. 74 is such a handy device that it is often advisable to forget the fact that at least one of the gears in the combination must run idle.

It is possible to avoid the idle running gears in such a bevel gear drive by the construction shown in Fig. 75, where the two pinions are mounted on a sliding sleeve, allowing one pinion at a time to be brought into mesh. This construction, quite common in the aprons of smaller lathes, is not well adapted for the transmission of considerable power and has other objectionable features, besides.

## Prospective Machinery Markets in China—Discussion

By W. H. Rastall
Chief, Industrial Machinery Division,
Bureau of Foreign and Domestic Commerce

My attention has been called to an article entitled "Prospective Machinery Markets in China," on page 888, Vol. 56, of *American Machinist*, and I will be glad if you will again direct the attention of your readers to this subject.

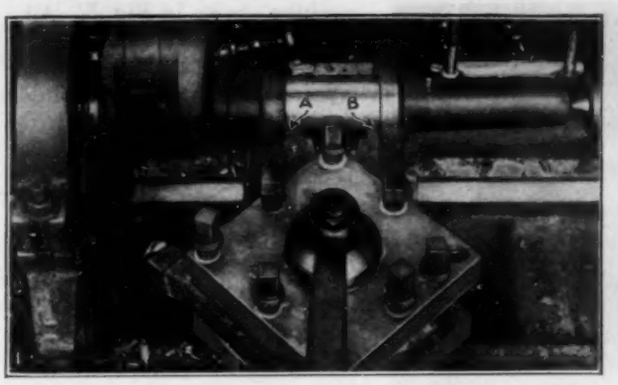
On the subject of exchange it is intimated that because the silver dollar of China is worth half the gold dollar this has a deterrent influence on the purchase of American goods. I feel that it is scarcely accurate to state the case in this way because the silver dollar of China was worth approximately 50c throughout the pre-war period and the present rates may be taken as practically normal. Consequently the position of the Chinese dollar can scarcely be considered a deterrent influence but represents the normal value and should be the basis for healthy trade.

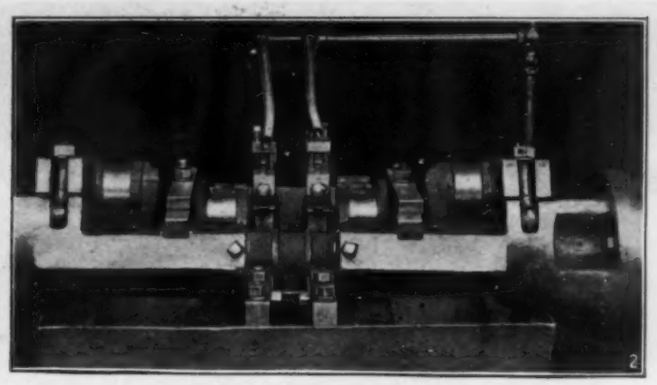
Two years ago we had what was practically a "seller's market" and conditions were most abnormal, and it would be unfortunate if American manufacturers estimated the value of the China market on this basis, for the truth is that the American participation in the machinery trade of China has been constantly improving since 1914, having advanced from about 9 per cent to 54 per cent during that interval, and as expressed in money the increase is even more rapid, having risen from 681,170 haekwan taels in 1914 to 12,181,382 haekwan taels in 1920, as was shown on page 144 of the same volume.

I feel that the American manufacturer of machinery has now a pre-eminent position in the China market. American engineering is vastly superior to that from abroad and this superiority has a definite recognition. If our manufacturers will but arrange for constructive sales programs in support of their products, they may be expected not only to maintain but to improve their already leading position in the China trade.

## Public and Private Employment Agencies

Private employment agencies in Pennsylvania are required to take out a license so as to place them under state supervision. There were 278 such licenses issued in 1921. Each agency makes a weekly report of its activities as well as the kind of placements made, the total placements being 85,375 as against 92,561 by the ten state employment bureaus. Such a comparison indicates that the state activities are slowly but surely working their way to the front in matters of this kind. The report of the Bureau of Employment of Pennsylvania for 1921 is full of interesting figures of this sort. It shows the present day trend of governmental supervision of public welfare organizations.



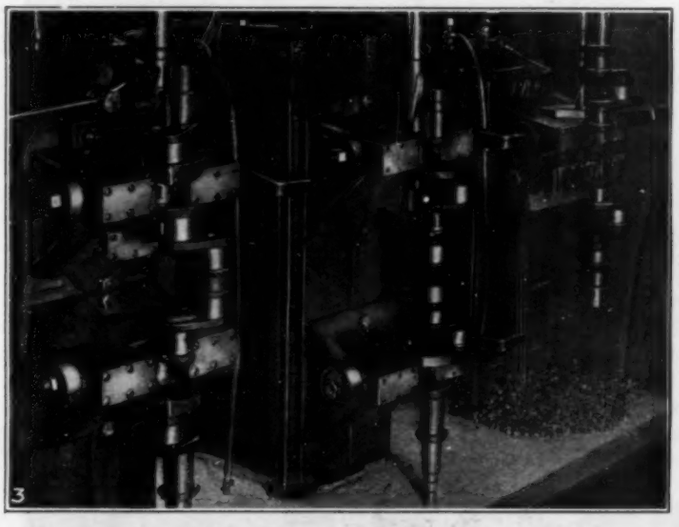



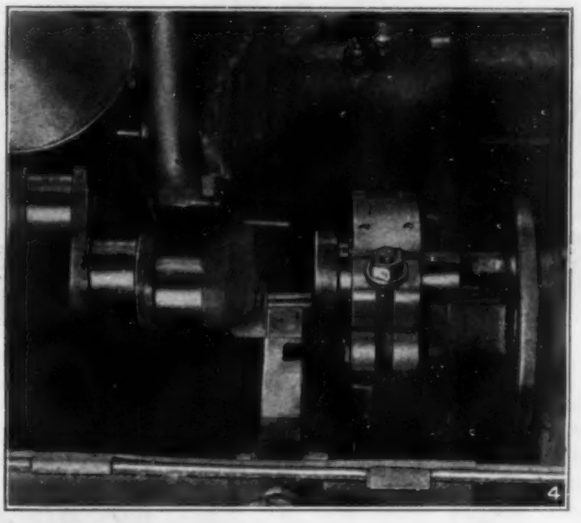
# Crankshaft and Camshaft Work

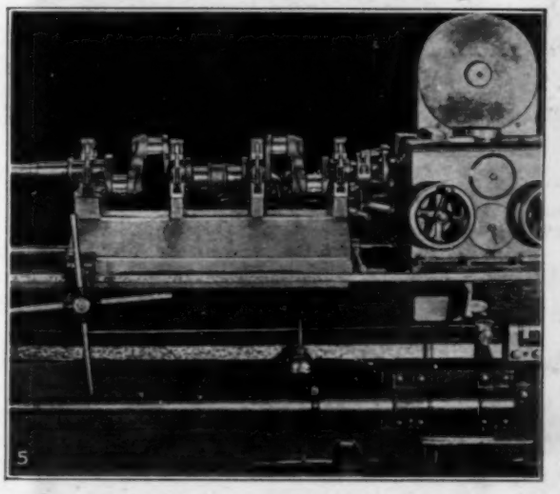
BY FRED H. COLVIN
Editor, *American Machinist*

THE crankshaft described is for a six-cylinder motor and has four bearings of rather large diameter, the crankpins being 2.5 in. Snagging, rough-straightening and spot-grinding bearings Nos. 2 and 3, as well as the rear bearing, are among the first operations. Turning the end bearing is shown in Fig. 1, a square turret-toolpost being used to good advantage. The tool at the left turns the bearings, but for squaring down the shoulders the toolpost is swung corner-wise and the two tools *A* and *B* are fed straight into the work. Turning the toolpost in this position allows the crankpin at the left to swing clear and at the same time prevents overhang of the cutting tools.

The crankpins are turned in double-headed lathes,







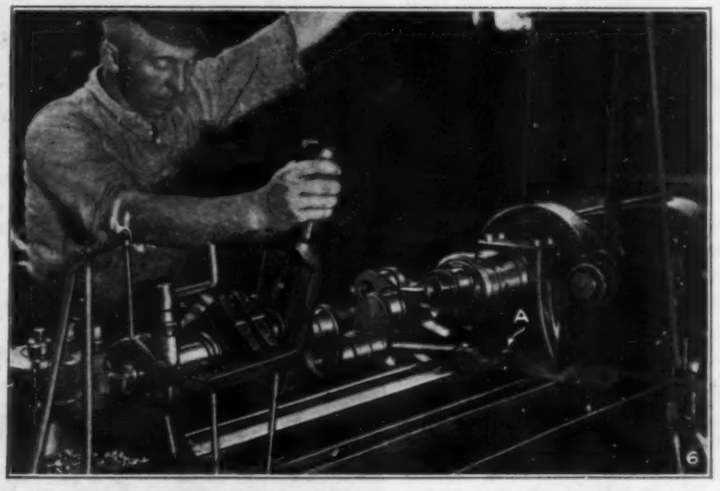



FIG. 1—TURNING AN END BEARING. FIG. 2—TURNING THE CENTER PINS. FIG. 3—DRILLING THE CRANKPINS
FIG. 4—GRINDING THE CRANKSHAFT. FIG. 5—TESTING THE RUNNING BALANCE
FIG. 6—POLISHING THE CRANKPINS

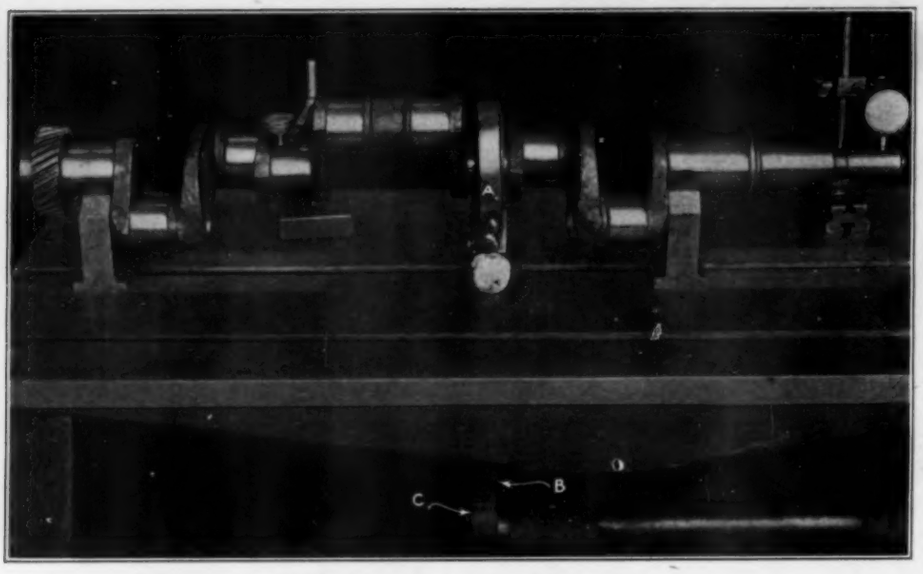



FIG. 7. TESTING FOR DEFLECTION

machine shown in Fig. 5. All bearings are then polished in a lathe as in Fig. 6, the regular type of polishing clamp being used. The main bearings are polished by resting the ends of the clamp against the front of the lathe bed, but with the pins the operator follows them around with the handles of the clamp in his hand. Another polishing clamp is shown at *A*.

After the timing gear has been pinned in place, the shaft is inspected and straightened on the table shown in Fig. 7. The shaft is supported at the two end bearings and the amount of deflection tested at each of the center bearings. The extreme end of the shaft is also tested to show any eccentricity or "run-out," this being held within very close limits. The supports can, however, be easily moved and the hook *A*, through the rod *B* and the cam *C*, exerts any desired pressure.

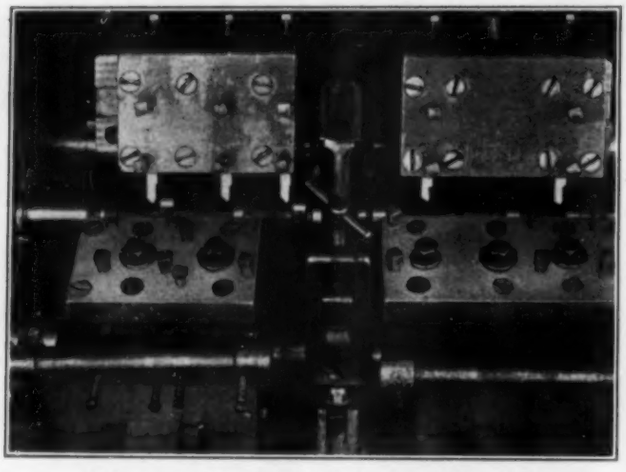


FIG. 8. ROUGH-TURNING THE CAMSHAFT

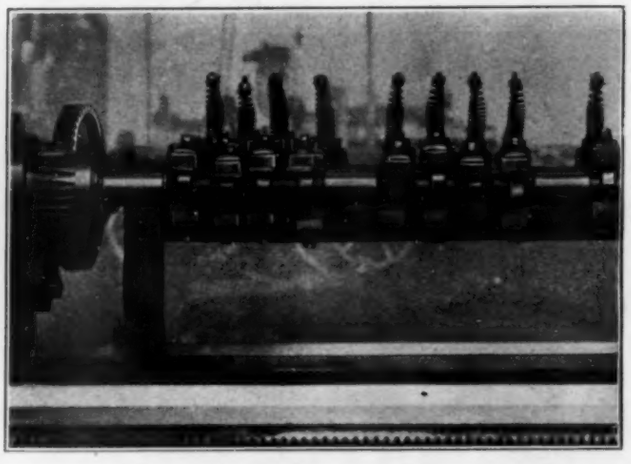


FIG. 9. POLISHING THE CAMS

one of these being shown in Fig. 2, roughing the two center crankpins. It shows how the crankshaft is clamped in the supporting chucks and the type of cutting tools used. The turning tools are in front and the squaring tools are above the pins.

The fixtures for drilling the various crankpins can be seen in Fig. 3. They are of similar design but the jaws are so spaced as to grip the pins being drilled. Each fixture drills the two pins lying in the same line. Self-centering jaws are used, each pair being operated by an independent handle. The jaws allow the work to be easily handled either in or out.

The grinding is done in the usual manner, the driving and clamping fixture being shown in Fig. 4. Each shaft is carefully balanced on the Carwen

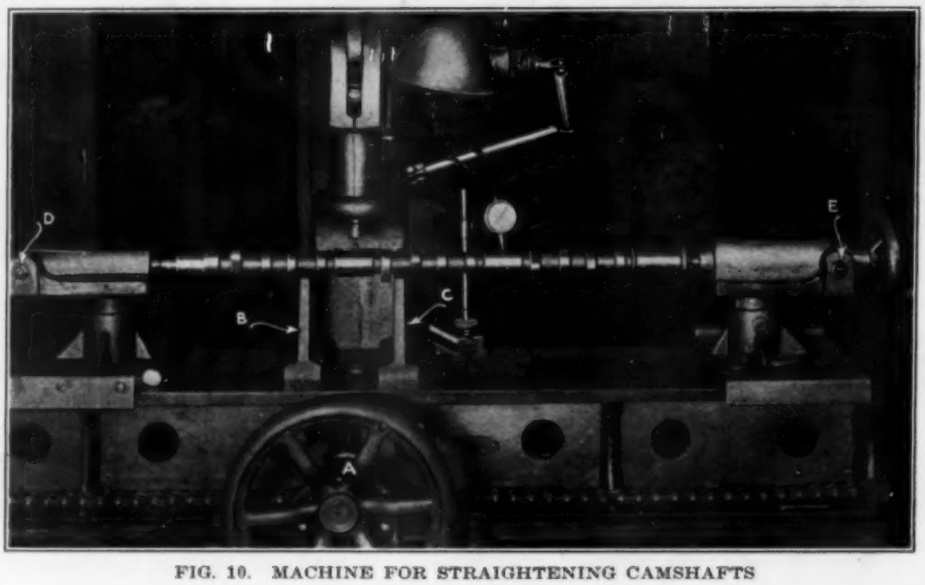



FIG. 10. MACHINE FOR STRAIGHTENING CAMSHAFTS

The camshaft is handled in much the usual manner, cutting to length, careful centering and rough-straightening being the preliminary operations. The flange is next turned and then comes spacing of the cams, and the turning between cams as in Fig. 8, a Fay automatic lathe being used. Near the end of the camshaft is a cam for driving the oil pump. The cams are polished in the device shown in Fig. 9, an old lathe bed being used for the purpose. The polishing jaws or clamps carry felt pads and are held together by spring tension. They are free to move up and down as the camshaft revolves and quickly polish the cams.

Copper plating is used to prevent carbonizing between the cams and bearings. The grinding of the cam is divided into three operations, the last being after the hardening and straightening. In fact there are several straightenings to take care of all spring which may have developed in or between the different operations. The final straightening is shown in Fig. 10, which gives a good idea of the machine used for this purpose. The two centers can be moved at will by means of the handwheel *A*, so as to bring any desired portion under the ram of the straightening press. These centers swing up from the pivots *D* and *E* for quick handling of the work. The supports *B* and *C* are easily moved so as to give a long or short bend. The whole arrangement is very compact as well as convenient, not forgetting the location of the lamp for throwing the light exactly where it is wanted.

## Perfecting a Drop Forging

By J. H. G. Williams
Assistant Works Manager, Billings & Spencer Co.

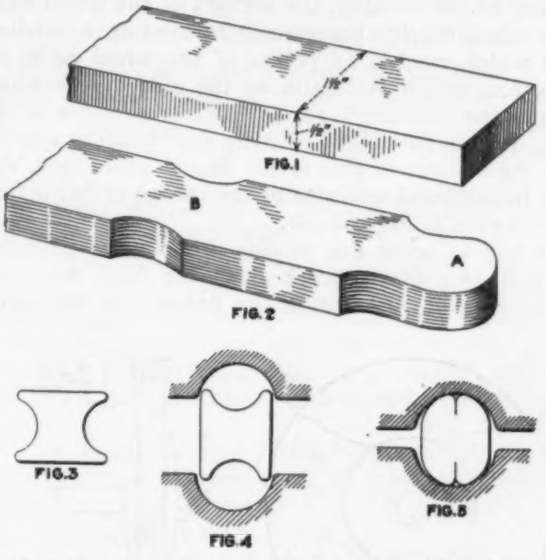
Purchasers of drop forgings often are of the opinion that once the dies are made, it is a simple matter to produce sound forgings, and the manufacturer often is of the opinion, privately of course, that the purchaser is unreasonable, because he cannot understand how difficult it is to produce sound forgings.

This disturbing situation is due to a lack of knowledge of the principles underlying the flow of metal in the plastic condition. Scientific research on the subject has not been linked up with the practical applications. The individual diemakers have accumulated through experience an empirical knowledge. Every set of drop-forge dies is largely the expression of an individual opinion as to the flow of plastic metal. Feeling that it is advantageous sometimes to study the reverse side, the accompanying sketches are exhibited to illustrate how metal did not flow in the manner originally planned.

The forging under discussion is the head of a mechanic's square. The piece is forged double for at least two reasons: The rate of production is increased, and there is less weight of metal involved in the manufacture of two forgings than would be if the two forgings were made singly. The flash or excess metal in the center is punched out, which leaves two forgings supposedly ready to machine for use.

At this stage of manufacture, the forgings were inspected and during the production of the first few dozen certain defects called "laps" and "cold shuts" were discovered, the causes and elimination of which constitute the basis of this paper. Low carbon steel 1½ x ½ in. was used as raw material. As originally made, the first operation consisted of redistributing the metal from the uniform section shown in Fig. 1, to that shown in Fig. 2. It will be observed in Fig. 2 that there is a mass or bunch of metal at *A* and *B* corresponding approximately to the positions that the bosses will occupy.

There are very substantial reasons for this preliminary distribution of metal. First, the productive life of the die blocks is prolonged by removing from the impressions the burden of this mass movement of metal. Second, by distributing the metal in masses, to the approximate position required by the impressions in the dies, the formation of a true, sound forging is promoted. The next forging step is an extension of the preceding operation. The original uniform section of the bar has now become a non-uniform section in which the metal has been distributed as masses into




FIGS. 1 TO 5. STEPS IN THE FORGING PROCESS

positions from which the forging impression can work or mold these masses into the desired finished shape.

The section of the partially formed forging as it comes from the first or "edger" operation is something like Fig. 3. When placed under the dies for the second or "rough blank" operation, it is given a quarter turn so that the cup shape faces the impression, Fig. 4. The action of the dies upon the lips if the cup-like section is to lap them over somewhat, as shown in Fig. 5. These laps were eliminated by omitting the use of the edgers. It was found after making the first dozen forgings, that the bar stock could be placed between the "breakdown" impressions, without the necessity for any previous preparation of stock, and without the formation of any laps.

Several methods are used for removing the conditions which promote the formation of various defects and all are based upon the principle of providing a central space into which the excess metal may flow. For instance, the center can be punched out, or the thickness of the central web may be forged undersize, previous to finish forging, or the bosses in the finished impression may be hollowed out.

The first forging produced after a hammer set up is carefully examined for forging defects, and adjustments or alterations are made to overcome the objectionable features. By carefully checking up each forging during this period of adjustment, the dies are finally brought into such condition that a continuous run of perfect forgings may be produced.

Abstract of paper read before American Society for Steel Treating.

# Grinding Wheel Breakage and Its Causes

## Continuing the Discussion of Causes—Details of a Correctly Mounted Wheel—Necessity for Balance—Why Wheels Are Weakened by Balancing Weights

BY HAROLD E. JENKS

MANY breakages are directly due to pressure on the side of the wheel. They occur to a limited extent when work is being traversed across the face of the wheel but more especially when grinding is actually done on its side. Also, particularly in snagging operations, large side pressure may be produced by grinding on, or working, the corners of the wheel face.

The effect of side pressure is to produce a bending stress which reaches all points of the wheel as it revolves, and which is tensile on the side of the wheel on which the pressure is applied and compressive on the other. It is impossible to do more than roughly approximate the amount of this stress in any given case, due to the incomplete knowledge of the theory of flat plates, of which this is an example.

The typical break due to side pressure, as indicated in Fig. 4, is a curved crack extending from the wheel face to a point just inside the flange and out again

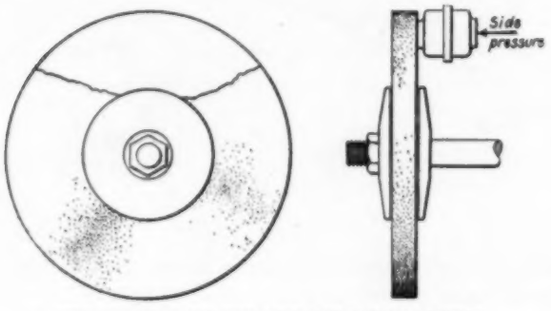



FIG. 4—BREAK DUE TO SIDE PRESSURE

to the face at a point from 150 to 170 deg. from where it entered. It is approximately a hyperbola with its vertex at the point just under the flange.

The best protection against breakage due to side pressure is obtained by flanges of proper design used on wheels of sufficient thickness. Flanges not only greatly reduce the maximum stress due to this pressure, but also prevent a large stress at the circumference of the hole, where it would otherwise combine with the ever present maximum stress due to centrifugal force. The proper design of flanges will be discussed below.

### How a Wheel Should Be Mounted

*Improper mounting.* In order to understand what is meant by improper mounting it is obviously necessary to know the essentials of correct mounting. The subject is of such importance to all grinding wheel users that the following brief statements of these essentials are given. Fig. 5 shows the details of a wheel correctly mounted.

Care should be taken that the sides of the wheel and the sides of the flanges in contact with the wheel are plane surfaces, in order that an even bearing may be secured. This, of course, does not apply to tapered wheels, in which case the flanges should have the same taper as the sides of the wheel.

The bushing should be of a diameter from 0.002 to 0.005 in. larger than the spindle or arbor on which the wheel is to be mounted, and must have its axis at right-angles to the sides of the wheel, concentric with the circumference. No portion of the bushing should project beyond the sides of the wheel.

The wheel spindle should be perfectly straight and threaded in a direction such that any tendency for the wheel and nut to turn will tighten the nut.

Flanges are used primarily to transmit power from the shaft to the wheel, and for this reason the inside flange must be keyed to the shaft. Both flanges must have plane faces at right-angles to the shaft, except for tapered wheels, where the flange faces are conical, with the axis of the cone coinciding with the axis of the shaft. Flanges should be properly relieved; that is, should be countersunk so as to bear on the wheel only on the part of the flanges nearest the rim. Both flanges should be of the same diameter, which should be at least one-third the diameter of the wheel and preferably one-half.

Blotters or some other form of compressible washers should be used between flange and wheel to insure an even bearing. Their diameter should be at least as large as that of the flanges.

The spindle nut should be tightened only enough to properly hold the wheel. Further tightening is unnecessary and undesirable.

These are the essentials of correct mounting. Failure to observe any of them may cause excessive stress in the wheel. Side pressure producing large tensile stresses may result from any defect in mounting that gives an uneven bearing between flanges and wheel.

Forcing a wheel on a spindle for which it is too small is extremely likely to cause breakage, as large tensile stresses are induced around the circumference of the hole. This case is practically the same as that of heating the wheel spindle, and the same character of stresses results. If the hole is too small it should be carefully enlarged by scraping until a perfect fit is obtained.

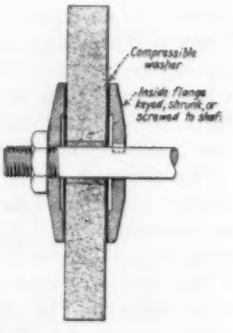



FIG. 5—CORRECT MOUNTING FOR GRINDING WHEEL

*Impact on the side or face of the wheel.* Probably most breakages due to impact are the result of carelessness or ignorance on the part of the grinding wheel operator. It should be borne in mind that very much larger stresses are produced by a force suddenly applied than by a force of the same intensity applied gradually.

The impact of the particles of the wheel against the work in any form of grinding produces certain stresses in the wheel, but these are carried more by the particles in direct contact with the work than by the wheel as a whole, and are not important as a cause of breakage. In some cases, however, ignorant operators, in order to

increase the speed of cutting, have hacked the face of the wheel in such a manner as to cause breakage due to the excessive impact thus obtained.

Breakages are sometimes caused by bringing heavy pieces of work into too sudden contact with either the face or side of the wheel. Carelessness in snagging a casting suspended from a chain hoist, for example, might easily result in breakage of this kind.

In work where a table traverse is used, the headstock or footstock may be accidentally run into the wheel, which will cause wheel breakage unless something else gives way first. This is not true impact, but approaches it on account of the sudden application of the force. Large stresses due to side pressure are produced.

Catching of the work between the wheel and the rest, in freehand operations is very likely to cause breakage. Such an accident may be the result of improper adjustment of the rest or of carelessness in handling the work, and may have very serious consequences. This is a true case of impact, as the speed of application of the force is practically that of the periphery of the wheel.

*Cracks or flaws in the interior of the wheel.* Wheel breakage sometimes occurs because of cracks or flaws which are in the wheel before it is put in operation. Such defects may lie under the surface of the wheel and be entirely invisible. Flaws are manufacturing defects, while cracks may also be due to faulty manufacture or to various other causes such as carelessness in handling, packing, transporting or mounting.

### Testing for Flaws and Cracks

Most grinding wheel manufacturers use extreme care in testing wheels for flaws and cracks so that a wheel having such defects seldom passes inspection and is shipped outside the factory.

Wheels are tested by running them at about double the recommended operating speed, as previously mentioned. This is a severe test, and should eliminate all wheels having inherent defects of a serious nature. The "ring" of a wheel, or sound produced by its vibration when tapped lightly with some solid object, is also used as an indication of interior cracks or flaws. A wheel with a clear ring is fairly certain to be free from such imperfections, although it has been shown that a poor or dead ring does not necessarily mean a defective wheel. However, the most reliable manufacturers reject all wheels that have a poor ring. It is also worthy of note in this connection that ringing a wheel just prior to mounting it will usually detect cracks that may have been caused by rough handling subsequent to the time the wheel left the factory.

Although as indicated above, manufacturers use every precaution to prevent it, occasionally a defective wheel will survive the tests, and may break in operation because of its imperfections. Sometimes this cause of breakage will be indicated by the character of the fracture, which may show the location and nature of the defect. If the fracture shows a homogeneous mixture of grain and bond with no indication of defects, and if the wheel has been in operation more than a few minutes, it is generally safe to assume that breakage was not due to inherent cracks or flaws.

*Variation in density of wheel material.* If a wheel is poorly manufactured, especially when the mixture of which it is composed is not properly stirred prior to baking, it may vary in density at different parts. When the wheel revolves, the heavy portions will exert a centrifugal pull upon the remainder of the wheel, and complicated stresses will be introduced therein. It is possible that in some cases these stresses may be sufficient to cause breakage without combination with other stresses in the wheel. However, this is probably of rather rare occurrence, especially in wheels made by leading manufacturers, who use such care to obtain a proper mixture that great variation in density becomes improbable.

Slight variations in density do however occur, as proved by the fact that nearly all concerns balance some wheels by the insertion of a plug of metal near the bushing. We are led to the conclusion then, that many wheels in operation are stressed in greater or less degree due to these variations. Stresses of this type may of course combine with other stresses existing in the wheel and help to produce breakage.

### Dangerous Stresses from Lack of Balance

*Lack of balance.* By balance, as used here, is meant static balance. A wheel is out of balance when, if supported loosely on a horizontal axis through the hole, it has in some positions a tendency to turn about that axis.

A wheel that is out of balance has developed in it stresses of complex character which are due to the centrifugal force of its out of balance portions. These stresses are the same as those just mentioned in connection with variation in density, as such variation may, and in fact usually does cause lack of balance. In cases where the lack of balance is large, breakage may result, either from these stresses or from impact, as will appear below.

If a wheel for any reason goes out of true it will also go out of balance, since its center of rotation will no longer be at its center of gravity. Wheels may go out of true from such causes as a bent spindle, loose bearings, loose frame, improper use, variation in hardness of the wheel material causing excessive wear at some points, or from the hacking of the wheel face previousely mentioned. If a wheel is seriously out of true it will deliver a series of blows to work thrust against it thus producing large impact stresses. The stresses due to the centrifugal force of the out of balance portions of the wheel may also become large in this case, and will increase the usual maximum due to the centrifugal force.

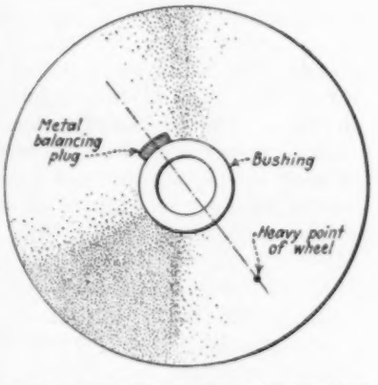



FIG. 6—METHOD OF BALANCING WHEEL

A wheel should not be allowed to stand partially submerged in water or other liquid, as when it is started in motion the wet portion is heavier than the remainder and hence the wheel is greatly out of balance. Several cases of breakage from this cause are known.

Lack of balance due to variation in density of the wheel material, provided it does not exceed a certain specified limit for the wheel in question, is usually corrected at the factory by the insertion of a metal plug in the side of the wheel near the bushing, as shown in

Fig. 6. This plug is placed opposite the heavy point of the wheel, which is the center of gravity of all heavy spots that may exist therein, and is of a weight sufficient to counteract the unbalanced centrifugal force.

Although this plug does balance the wheel, so that the lack of balance will not produce vibration in the machine and chatter marks on the work, this method of balancing does not by any means remove the stresses due to the centrifugal force of the out of balance portion, as this force remains, whether balanced or not.

A serious objection to the plug is that the wheel is weakened by drilling a hole to receive it. As stated above, this hole is drilled near the bushing, where the tangential stress due to centrifugal force is a maximum, so that the wheel is weakened at the point where breakage is already most liable to start.

It is also a fact that this method of balancing may not produce balance for more than a short part of the life of the wheel. For, since the original lack of balance may have been due to several heavy spots, it is evident that if one of these spots is worn off the amount of out of balance and the center of gravity of the heavy portion of the wheel will in general change, so that the balancing weight no longer balances. In the particular case where the entire heavy portion of the wheel is worn away this weight becomes an unbalancing weight, since the wheel would be balanced, or nearly so, without it.

Enough has been said to show that if a wheel contains a balancing weight, we should regard it as a somewhat faulty one, more liable to break than one which needed no balancing, and probably more liable to go out of balance. This does not mean that a large percentage of balanced wheels break, for these wheels are required to pass the same tests in the factory as do all other wheels sent out. Reliable manufacturers at present reject all wheels in which the lack of balance exceeds a certain specified limit.

### Locating Initial Stresses

*Initial stresses in the wheel.* During the process of manufacture of a solid body, initial stresses are sometimes set up in the material of which the body is composed. This is in general due to the fact that the exterior of a heated body cools more rapidly than the interior. The higher the rate of cooling, the greater these stresses are likely to become. Unless great care is used in its manufacture a grinding wheel may have initial stresses existing in it. These may be regarded as incipient flaws or cracks, and may combine with other stresses to increase the maximum stress.

No method has yet been devised for determining the existence of initial stresses in wheels. Manufacturers guard against the occurrence of large stresses of this type by allowing a period of a week or more for the wheels to cool after baking before their removal from the kilns. The speed test referred to above should also tend to eliminate wheels containing extraordinary initial stresses. Hence it is probable that wheels breaking in operation contain only relatively small stresses of this kind, which may be regarded only as a contributing cause of breakage in combination with other and larger stresses.

From the foregoing analysis it is evident that the breakage of a grinding wheel in operation is in general the effect of several combined causes, of which the stress due to centrifugal force is usually one. The part of the wheel around the circumference of the hole may be regarded as its weakest point, since it is there this stress attains its maximum, hence all additional factors tending to produce more stresses near the hole are particularly important.

Manufacturers find that with the majority of broken wheels returned to them for an opinion regarding the cause of breakage, so little information is given that they are unable to arrive at any conclusion whatever. For instance, a customer may return a small fragment of what was a large wheel, with the information that the wheel broke while being used for snagging iron castings. Needless to say, in such cases the cause of breakage remains unknown.

### Record of Breaks and Causes

In case there is no question as to why the wheel broke, as when it is run into by the headstock of the machine, no further information is necessary. When there is any doubt as to the cause, however, as much of the following data as can be obtained should be recorded and kept for future reference:

(1) Make, number, original diameter, thickness, diameter of hole, grain and grade of wheel, and diameter at time of breakage.

(2) Name and number of machine on which breakage occurred and condition of same, particularly the spindle and bearings.

(3) Operation for which wheel was used, including the kind of material being ground.

(4) Speed at which wheel was running. (This should be verified after the breakage.)

(5) Wet or dry grinding. If dry, note whether or not the wheel was hot at time of breakage. If hot, give approximate temperature of face of wheel as determined by the touch.

(6) Length of time wheel had been running since last starting up.

(7) Size and condition of flanges.

(8) Description of compressible washers used; if blotters, state size.

(9) Method used for tightening spindle nut.

(10) If wheel was used with automatic feed and traverse, give depth of cut and speed of traverse. In case the work is revolving, give its revolutions per minute.

(11) Describe any marks on sides or face of wheel indicating excessive impact or side pressure.

(12) Give results of examination of fracture, including any defects that could be noted in the wheel material.

(13) State whether or not wheel contained balancing weights. If one was present, give approximate size. Note whether or not the wheel fracture passed through the hole drilled for the weight.

(14) Give operator's opinion of the cause of breakage if he has one, also whether he has noticed any lack of balance in wheel or has had any difficulty in keeping the wheel running true.

This data and a thorough knowledge of the causes of grinding wheel breakage constitute proper equipment for the investigation of any given case. Under some conditions the actual determination of the cause of breakage of a single wheel may be difficult or impossible. In cases, however, where breakages occur consistently with a particular operator or on a particular machine or operation, it is reasonable to suppose that there are one or more principal causes that can by a study of the situation be detected and removed.

# The World Trade in Machinery

## Exports by Germany, United Kingdom, United States and France—Information Based on Custom House Returns—Effect of Changes in Exchange

By WILLIAM ALTHOFF

Assistant Chief, Industrial Machinery Division, Bureau of Foreign and Domestic Commerce

THE present position of Germany as a competitor in the world's machinery markets has been considerably overrated by many writers.

The accompanying chart shows the machinery exports of Germany, the United Kingdom, the United States, and France for the four years preceding the war, as well as during the four years beginning with 1918. Table I shows the percentage furnished by each of these countries in relation to the total of the four combined.

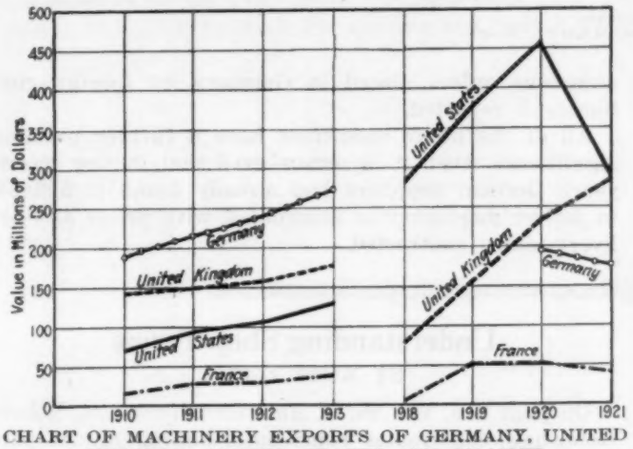



CHART OF MACHINERY EXPORTS OF GERMANY, UNITED KINGDOM, UNITED STATES AND FRANCE

There is also appended Table II, indicating the machinery exports of other important countries during 1920 and 1921, which will afford a basis of comparison with the returns given in Table I.

These figures are based on the custom house returns. It should be remembered that differences exist between the classifications adopted by the various countries and the figures are presented more with the idea of illustrating the general trend of trade than of indicating the precise amounts claimed by each country.

As can be seen from Table II, during the years 1910 to 1913 inclusive, Germany, the United Kingdom, the United States and France exported annually a total average of $530,000,000 worth of machinery. Throughout this period Germany held first place, but its proportion fell from 45.1 per cent of the total of these countries in 1920, to 43.6 per cent in 1913. The proportion of the United Kingdom also declined continually during these years, and in 1913 its share was only 28.8 per cent as against 33.1 per cent in 1910. The United States, on the contrary, secured a larger proportion each successive year, rising steadily from 17.1 per cent of the total in 1910 to 20.8 per cent in 1915.

In 1918 and 1919 the United States furnished the bulk of the machinery exports, the actual amounts being $282,000,000 and $378,000,000 respectively.

During 1920 Germany was again in the field, the total of the four countries ascending well on toward a billion dollars. Of this the United States supplied nearly one-half, 48.9 per cent, the United Kingdom 24.6 per cent, and Germany 20.8 per cent.

The United Kingdom alone showed an increase in the value of its exports for 1921, due largely to heavy shipments of textile machinery on orders that had long been unfilled. Machinery exports from the United States fell off considerably during 1921, this being due in a large measure to the reduction in unit prices and to the extraordinary exchange situation that prevailed.

It should be particularly noted, however, that our machinery exports last year exceeded in value those for 1918, and were more than twice as great as in 1913.

In other words, during 1921 we exported machinery to the extent of $290,000,000 or 36.2 per cent of the total of the four countries combined, as against $130,000,000 or 20.8 per cent of the 1913 total.

The outstanding feature of the figures presented herewith is that in 1920 and 1921, Germany (in spite of the advantages of favorable exchange rates, low wages, government subsidies, etc.) exported only about one-half the proportion it shipped during the pre-war period.

Fundamental conditions at present existing in Germany are such as to seriously impair its position as a competitor in the world machinery markets. To a large extent its low costs have been the result of direct and indirect government subsidies which the German government must necessarily abandon. Government control as applied to grain prices has already been abolished, bringing about a general movement for

TABLE I —MACHINERY EXPORTS OF GERMANY, UNITED KINGDOM, UNITED STATES AND FRANCE
(Values in U. S. Dollars)

| | 1910 | | 1911 | | 1912 | | 1913 | |
|---|---|---|---|---|---|---|---|---|
| | Dollars | Per Cent | Dollars | Per Cent | Dollars | Per Cent | Dollars | Per Cent |
| Germany | 193,974,835 | 45.169 | 217,407,998 | 43.529 | 244,378,193 | 44.614 | 273,035,559 | 43.671 |
| United Kingdom | 142,449,170 | 33.171 | 150,670,139 | 30.167 | 161,363,480 | 29.459 | 180,121,988 | 28.810 |
| United States | 73,851,098 | 17.197 | 96,504,104 | 19.322 | 106,961,269 | 19.527 | 130,554,379 | 20.882 |
| France | 19,164,900 | 4.463 | 34,875,100 | 6.982 | 35,048,800 | 6.398 | 41,495,000 | 6.637 |
| Total | 429,440,003 | 100.000 | 499,457,341 | 100.000 | 547,751,742 | 100.000 | 625,206,926 | 100.000 |

| | 1918 | | 1919 | | 1920 | | 1921 | |
|---|---|---|---|---|---|---|---|---|
| | Dollars | Per Cent | Dollars | Per Cent | Dollars | Per Cent | Dollars | Per Cent |
| Germany | | | | | 197,337,787 | 20.885 | *179,667,830 | 22.449 |
| United Kingdom | 78,450,233 | 29.246 | 158,988,618 | 26.971 | 232,433,323 | 24.600 | 287,256,954 | 35.891 |
| United States | 282,986,853 | 67.225 | 378,425,958 | 64.198 | 462,933,704 | 48.995 | 290,414,115 | 36.285 |
| France | 10,851,618 | 2.577 | 52,050,170 | 8.830 | 52,138,732 | 5.518 | 43,011,022 | 5.378 |
| Total | 372,288,704 | 100.000 | 589,464,746 | 100.000 | 944,843,546 | 100.000 | 800,359,921 | 100.000 |

* Estimated on the basis of returns for May to December. Statistics for January to April, 1921, inclusive, have not been published as yet.

The following rates were used in converting the 1920 and 1921 foreign figures into dollars. These rates are the daily average for the year, as supplied by the Federal Reserve Board.

| | 1920 | 1921 |
|---|---|---|
| Germany | 1.1751 | 1.2045 |
| United Kingdom | 3.66427 | 3.849056 |
| France | 7.04 | 7.4554 |

higher wages. Freight rates and raw material prices are rising rapidly, and labor difficulties are becoming increasingly numerous. There is a shortage of both coal and coke. The forced internal loan contemplated by the German government will undoubtedly be demanded in the near future. The amount is about one billion gold marks, equivalent at present to approximately 70 billion paper marks. This loan will be a heavy burden on industry. The supplementary taxation that must necessarily follow will raise production costs still higher. Furthermore, Germany is becoming sold out and the continuation of production will involve increased purchasing of raw materials from outside sources at prices that will be almost beyond the German buyer, although in line with the general trend of prices in world markets.

These and other factors make it practically impossible to quote firm prices for long-term commitments. The tendency now is to quote prices subject to increases to cover any enhanced production costs that may occur before the goods are delivered. The cancellation of numerous orders placed in Germany by foreign customers is reported.

All of the above conditions have a further peculiar significance when it is remembered that during recent years German suppliers had already found it difficult to deliver machinery in accordance with prices and delivery dates contracted.

TABLE II.—ANNUAL MACHINERY EXPORTS
(Values)

| Country | 1920 | | | 1921 | | |
|---|---|---|---|---|---|---|
| | Value in Foreign Currency | Average Rate of Exchange | Value in U. S. Currency | Value in Foreign Currency | Average Rate of Exchange | Value in U. S Currency |
| Switzerland (Franc) | 276,466,000 | 16.903 | $46,731,046 | 228,850,000 | 17.3539 | $39,714,400 |
| Sweden (Krona) | 156,857,407 | 20.494 | 32,146,357 | 94,055,897 | 22.5397 | 21,199,917 |
| Australia (£ Sterling) | 5,179,252 | 3.66427 | 18,978,178 | 9,497,604 | 3.849056 | 36,556,810 |
| Belgium (Franc) | 239,041,298 | 7.38 | 17,641,248 | 249,104,342 | 7.4461 | 18,548,558 |
| Italy (Lire) | 322,929,575 | 4.97 | 16,049,600 | * | ..... | ..... |
| Canada (Dollar.) | 9,504,857 | ..... | 9,504,857 | 4,061,174 | ..... | 4,061,174 |
| Japan (Yen) | 16,710,133 | 50.368 | 8,416,560 | 12,883,101 | 48.2485 | 6,215,903 |
| Netherlands (Guilder) | 20,223,677 | 34.419 | 6,960,787 | * | ..... | ..... |
| Denmark (Krone) | 39,932,000 | 15.775 | 6,299,273 | * | ..... | ..... |
| Norway (Krone) | 9,726,900 | 16.53 | 1,607,857 | * | ..... | ..... |
| Total | | | $164,335,765 | | | |

* Statistics for 1921, for Netherlands, Italy, Norway and Denmark are not available.
Rates of exchange are the daily average for the year, as furnished by the Federal Reserve Board.

## A Large Magnetic Chuck

Scarcely a quarter of a century ago O. S. Walker, of Worcester, Mass., started in a small way to manufacture a new and untried device for holding work for grinding, in which the holding power was the attraction of an electromagnet.

At first believed to have but a limited field of application in the toolroom, the early chucks were little more than 4 x 6 in. in size and were considered practical only for the purpose of holding small pieces of hardened steel while grinding off the little material necessary to take out the warp and twist caused by the hardening, and make them flat and parallel.

As an evidence of the growth both in size and application of the magnetic chuck the accompanying picture is shown of a chuck that was shipped recently from the Walker factory to a firm engaged in the manufacture of knives for wood planers, blades for paper and metal cutting shears, and other heavy parts.

The chuck is of the standard single-magnet construction, practically identical in principal with the chuck of 25 years ago, but instead of the pigmy device that could easily be carried in one hand this one is 9 in. wide by 130 in. long, has ten independent magnetic coils, and weighs approximately 1,800 lb. It is supported at the ends upon trunnions 5 in. in diameter and may be swiveled to any desired angle.

## Understanding Shop Terms

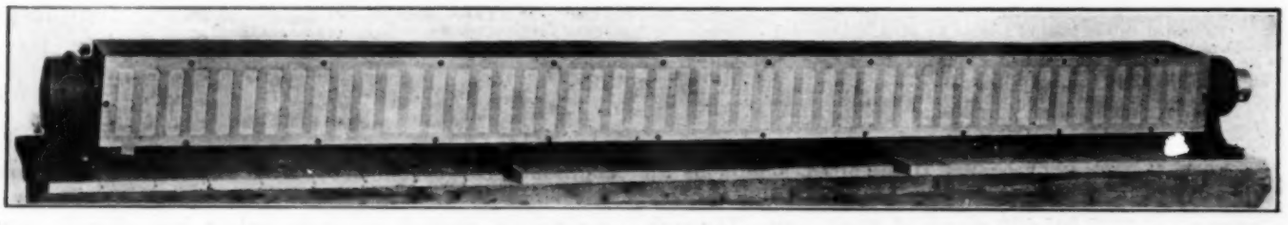
BY AMOS FERBER

On page 916, Vol. 56, of *American Machinist*, Robert Grimshaw contributes some entertaining, if not particularly instructive, misinformation in reference to shop terms.

New England did not invent the "shim," though it might have been the first to apply that name. A shim has been, since the days of Noah, a thin piece of packing material for providing adjustment between two otherwise non-adjustable parts. It is never (intentionally) a wedge. I make no claim to knowledge of foreign nomenclature, but I will venture to assert that in the United States a "shim" is known by its name and its purpose is thoroughly understood wherever an automobile exists.

A "dutchman" is a patch of any kind, shape or form, an unpremeditated addition to some part to correct or compensate for somebody's error or oversight in designing or machining that part. It is an abortion, and should never be tolerated except temporarily in case of extreme emergency.

I have heard the term "dutchman" applied, even in New England, to what was obviously a dowel; but such application is the result of ignorance of the "language," even as is the calling of a shim a dutchman in the Philadelphia district—if such be the case.



AN 1,800-LB. MAGNETIC CHUCK

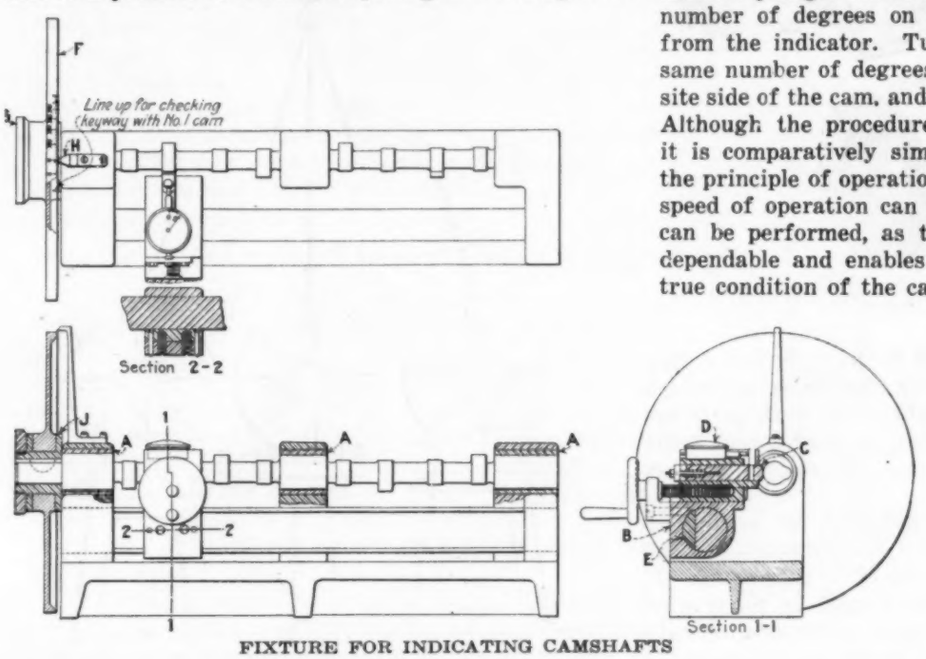
# Ideas from Practical Men

*Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.*

## Fixture for Inspecting Camshafts

By J. L. Strasburg
Assistant Master Mechanic, Saginaw Products Co., Saginaw, Mich.

Checking automotive camshafts is a job requiring accuracy and care. We built a fixture for use in our plant that greatly facilitates the work, and we believe it the finest thing we know of in its line. With this fixture it is possible to check the opening and closing time of all cams, using any amount of lash desired, also the relation of the intake and exhaust cams, the concentricity of the base circle, the location of the key with No. 1 cam, the lift at any number of degrees and the total lift.




FIXTURE FOR INDICATING CAMSHAFTS

The fixture is shown in the accompanying illustration. It is made so that the shaft is held in three bearings in the same manner that it is mounted in the motor. Springing that might occur with the shaft on centers is thus prevented. These bearings are made of steel, hardened and ground. The sliding block *B* carries the plunger *C* and the Ames indicator *D*. This block can slide from one end of the fixture to the other and is held in position by the segment *E* and by dowel pins and springs, shown in Section *2-2*, that produce the right amount of friction.

The plunger *C* is hardened and ground on the nose, which has the same shape as the nose of the push rods in the motor. *D* is a standard Ames indicator graduated in thousandths of an inch. The 12-in. dial plate *F* is graduated in 360 deg., and made in two parts. By loosening the handnut *G* and moving the dial around until the zero comes in line with the pointer *H* and then tightening the nut, one can get a direct reading in degrees on the part being checked.

To check the position of the keyway with reference to the No. 1 cam, line up the mark on the dial and the line on dial hub *J* and bring the pointer to zero, which will bring the keyway and the No. 1 cam in line. Bring the plunger *C* to position on the base circle of the cam, set the indicator pointer on zero, turn the camshaft so that the plunger comes up on the lift of the cam an even number of degrees on the dial, and take the reading from the indicator. Turn the cam 180 deg.; turn the same number of degrees with the plunger on the opposite side of the cam, and compare the indicator readings. Although the procedure seems somewhat complicated, it is comparatively simple when one is familiar with the principle of operation of the machine. Considerable speed of operation can be obtained. Reliable checking can be performed, as the instrument is accurate and dependable and enables the operator to determine the true condition of the camshaft.

To check the valve opening time on the camshaft, bring the plunger *C* against the base circle of the cam, set the indicator at zero, and move back the sliding block *B* until the indicator pointer drops below zero an amount equal to the lash allowed in the design of the cam. Then turn the cam until the plunger comes up on the rise of the cam and the indicator pointer comes back to zero. After loosening the handnut *G* on the dial and moving the dial until zero and the pointer are in line, turn the cam over the lift until the indicator comes to zero, and read the valve opening in degrees on the dial.

To check the relation of the cams with the No. 1 cam, bring the plunger *C* in the same position as before and the indicator pointer on zero, and turn the cam until the indicator starts to rise on the lift of the cam. Move zero on the dial to the pointer and lock, move the sliding block to the next cam, bring the indicator to the same position as on the No. 1 and check the dial reading against the cam layout. Repeat for the other cams.

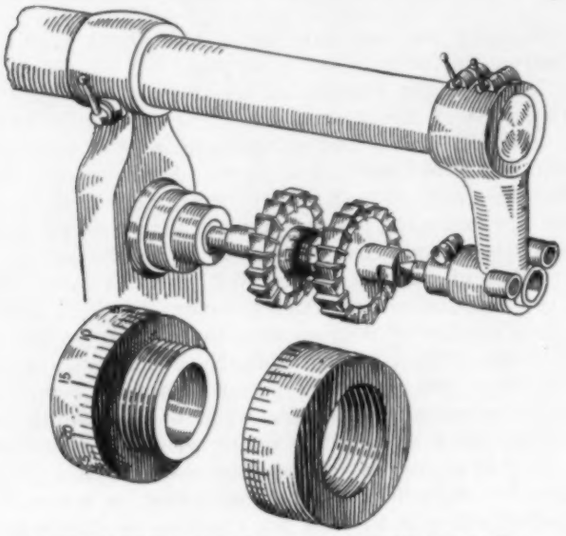
To check the closing and opening time of the exhaust and intake valves, bring the plunger *C* to position on the base circle and the indicator to zero. Turn the shaft until the exhaust cam has just reached the closed position, and set the dial to zero. Move the indicator to the intake cam and set to zero as before. Turn the cam until the indicator starts to move on the opening side of the cam and the dial reading will give the relation in degrees. Other points that can be checked are indicating the base circle, and checking the contour of the cam at any angle desired.

## Adjustable Spacing Collar for Milling Machine Arbor

By O. G. Weiss

For some years I have used the adjustable spacing collar shown in the sketch for locating straddle or side milling cutters to exact position on the arbor of milling machines.

This collar is made up of a bushing, the shoulder of



ADJUSTABLE SPACING COLLAR FOR MILLING MACHINE ARBOR

which is externally threaded 20 to the inch, and a ring nut fitted to this thread. With the collar assembled and screwed up tight, the peripheries of both parts are graduated to 50 divisions, giving an increase of 0.001 in. per division in length of the collar as the ring is unscrewed.

Where solid spacing collars are used for setting up gangs of cutters the set-up must be completed and the positions of the cutters tested for error in spacing. If such error exists, the whole set-up must be dismounted in order to correct it by addition or removal of thin washers. With my device the error can be corrected by merely loosening the nut at the end of the arbor and adjusting the collar one or more divisions as may be required.

## Device for Handling Lathe Chucks

By J. T. Towlson
London, England

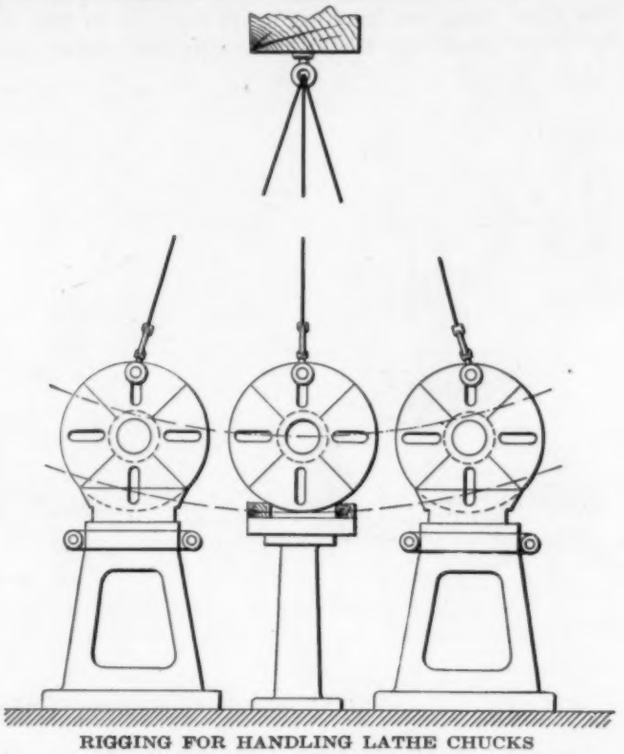
One good turn assuredly deserves another and so, as your contributors L. H. Gibbs and W. Burr Bennett have told us of useful devices for the handling of chucks on and off the lathe, it is to be hoped that a plan of my own may be of interest.

My machine shop has two rows of lathes with swings varying from 12 to 16 in., each lathe being provided with a steadyrest, a light chuck and a heavy chuck. When I say a "heavy" chuck I mean a *comparatively* heavy chuck, one weighing somewhere about 60 lb., and, anyway, too heavy for the latheman to handle conveniently with one hand while with the other he manipulates the belt to rotate the lathe spindle.

It is an old shop and has been added to again and again as new lathes and other machinery have been installed; therefore there is no remaining evidence of original design in the overhead "works." The beams are of wood and there is no room for cranes of any kind so, I have relieved the turners of the necessity of "wringing their backs" when shifting chucks, and saved them from "spelling" while waiting for a lift by making use of the following described device.

There are sixteen lathes arranged back to back in two rows, with a space of about 2 ft. between them. A plank, resting upon light columns, occupies a position midway between the two rows and, between each pair of lathes at a point about opposite the spindle nose of each pair, an eyebolt is screwed into the roof beam overhead. To each eyebolt is attached a light wire rope having a turnbuckle at the lower end.

When a turner desires to unship his chuck he attaches the turn buckle and sets it tight, then allows the lathe to run backward while holding the chuck with his hand



RIGGING FOR HANDLING LATHE CHUCKS

until it is unscrewed from the spindle, when he lets it swing by gravity to its normal position over the plank and loosens the turn buckle, leaving the tackle free to be used by the next man.

The whole device is very simple and is clearly shown by the illustration.

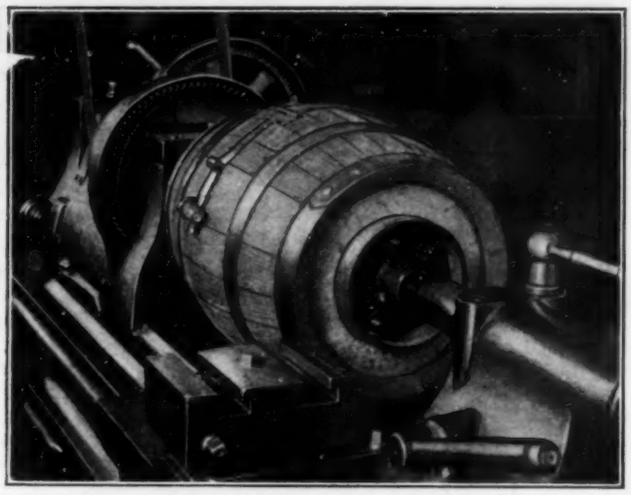
## Handy Tumbling Barrel for the Small Shop

By Hiram Hicks

From time to time articles have appeared in *American Machinist* describing "home-made" tumbling barrels and other similar crude devices for polishing or burnishing work that required this treatment. Here is one that the writer saw a few days ago in a small tool and manufacturing shop.

A small keg, of the kind that has been made so popular by Mr. Volstead, was fitted with a hinged door, secured by a hasp and staple, and flanges bolted to the respective heads so that it could be placed upon centers.

When needed it is filled with work, a dog placed upon one of the hubs and mounted in any lathe that happens



HOME-MADE TUMBLING BARREL

to be idle or convenient. Any speed that could possibly be required by a tumbling barrel is immediately available through the cone belt and back gears, or the speed changing mechanism of the lathe.

If the lathe should be needed for its legitimate purpose it is but the work of a moment to dismount the barrel without disturbing its contents.

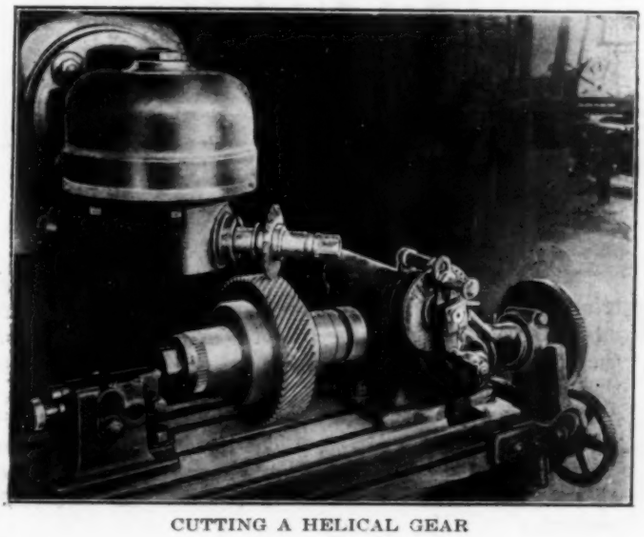
## Practical Example of Helical Gear Cutting

BY MILTON WRIGHT

The illustration shows an example of spiral, or helical, gear cutting as practiced in the shops of the Persons-Arter Machine Co., Worcester, Mass. The gear is a part of the regular shop product, being the driven gear on the chuck spindle of the standard rotary surface grinding machine, and is cut without special equipment.

Two gears are cut at once. The part that appears in the picture as a single gear is actually two gears placed face to face on an arbor that is provided with means for drawing them together endwise.

The machine used is a standard Milwaukee milling machine with universal attachment and the characteristics of the gear are as follows: Material, cast iron; pitch, 0.314 in.; thickness of tooth at pitch line, 0.157 number of teeth, 58; pitch diameter, 8.203 in.; angle of helix, 45 deg. left-hand; circular pitch, 0.443 in.; normal pitch 0.314 in.; thickness of tooth at pitch line, 0.157 in.; depth of tooth, 0.216 in. The theoretical lead of the helix is one turn in 25.773 in., and the nearest actual lead that could be obtained without special gearing is one turn in 25.8 in., a difference of but 0.027 in. in a distance of approximately 25 in. The gears used are 100 on the screw, 72 and 24 on the compound stud and 86 on the indexing spindle. An idle gear is of course necessary to reverse the direction of the lead.



CUTTING A HELICAL GEAR

A No. 2, 10 pitch B & S spur gear cutter is used, somewhat larger than the standard cutter because of the increased diameter required to enable the work to clear.

## Special Wrench for Making Adjustments to Valve Push Rods

BY G. A. LUERS

To make adjustments to valve push rods or tappets, three wrenches are usually required, one to hold the tappet, one to turn the adjustments and the third to handle the locknut. This invariably requires a second

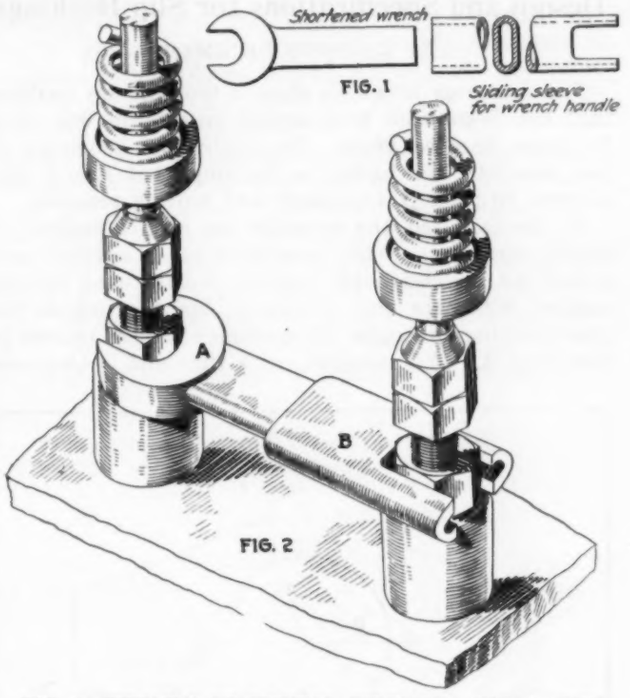



FIG. 1—DETAILS OF SPECIAL WRENCH. FIG. 2—THE WRENCH IN USE

mechanic or helper, unless some special wrench is available which will hold on to the push rod without falling when released by the hand.

For adjusting valves single handed, the tool shown in Fig. 1 can be made by any mechanic in spare time, from a wrench with an opening to suit the hexagon head on the push rod. Cut the length of this wrench (if too long) to swing between the valves and add a slip handle as is shown in the attached sketch. This slip handle is made from a flattened tube and is to be a snug push fit on the handle of the wrench. Cut away a portion of the end of the tube so that it will pass about the largest diameter of the nut or the distance equal to that across the corners.

To use this tool, place the wrench on the hexagon head of the push rod to be held as at *A*, Fig. 2, and swing it about until the open end of the slip handle can be pushed past the adjacent valve at *B*.

## Step Bearings for a Light Jib Crane—Discussion

BY S. KELLY

I have read with interest W. Burr Bennett's description of a step bearing for a light jib crane which appeared on page 528, Vol. 56, of *American Machinist*, and believe a bearing so constructed to be suited admirably to a great many uses.

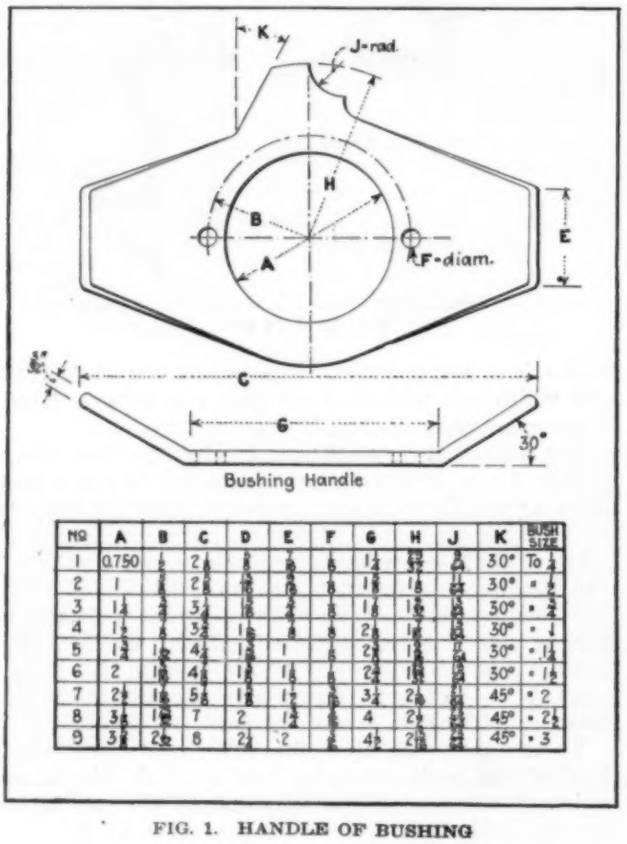
On account of the cost of such a bearing, however, I cannot agree with Mr. Bennett as to its practical application to a jib crane. I am of the opinion that most superintendents and maintenance men would insist on having the step bearing of a jib crane made of a cast bracket with a cored hole having a slightly concaved bottom. The mast trunnions could be merely pieces of round stock $\frac{1}{32}$ in. smaller than the cored hole, with one end rounded to fit the bottom and the other end flattened to fit between the beam flanges of the mast.

## Design and Specifications for Slip Bushings

BY RAYMOND BECKMAN

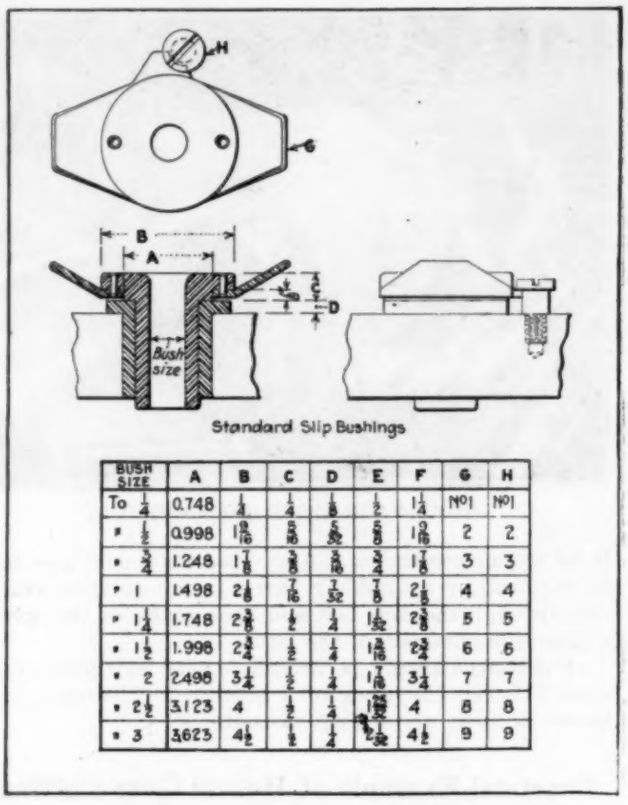
The drawings herewith show a type of slip bushing that has been used with entire success in our shop for more than two years. The design was prompted by the necessity for having a bushing that would lock securely in place, yet be easily and quickly removed.

To the initiated, the necessity for such a bushing is readily apparent. When used with oil or cutting compound the knurled head bushing usually used in connection with jigs and fixtures is apt to stick in the liner bushing and cause the workman endless trouble in removing it. This requires extra time and is also very trying to the workman's patience, especially if he is on piecework.



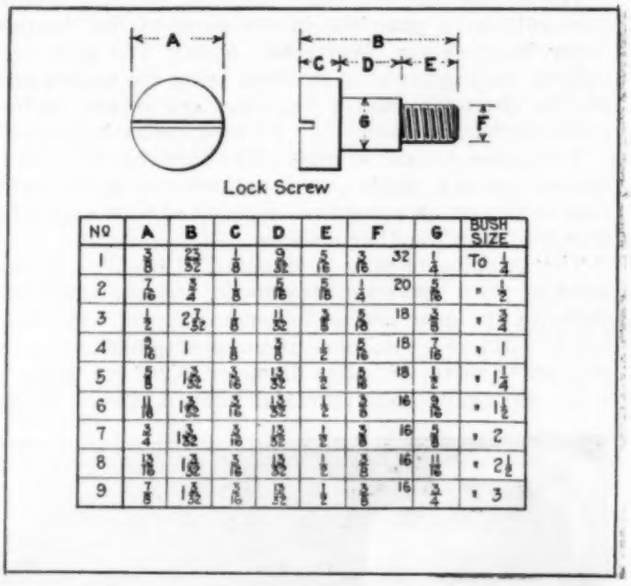

| NO | A | B | C | D | E | F | G | H | J | K | BUSH SIZE |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 0.750 | $\frac{1}{2}$ | $2\frac{1}{8}$ | $\frac{5}{8}$ | $\frac{7}{16}$ | $\frac{5}{8}$ | $1\frac{1}{4}$ | $\frac{23}{32}$ | $\frac{3}{8}$ | 30° | To $\frac{1}{4}$ |
| 2 | 1 | $\frac{1}{2}$ | $2\frac{1}{8}$ | $\frac{15}{16}$ | $\frac{7}{16}$ | $\frac{5}{8}$ | $1\frac{1}{8}$ | $1\frac{1}{8}$ | $\frac{3}{8}$ | 30° | " $\frac{1}{2}$ |
| 3 | $1\frac{1}{4}$ | $\frac{1}{2}$ | $3\frac{1}{4}$ | $1\frac{5}{16}$ | $\frac{7}{16}$ | $\frac{5}{8}$ | $1\frac{1}{8}$ | $1\frac{5}{32}$ | $\frac{3}{8}$ | 30° | " $\frac{3}{4}$ |
| 4 | $1\frac{1}{2}$ | $\frac{1}{2}$ | $3\frac{1}{2}$ | $1\frac{5}{16}$ | $\frac{7}{16}$ | $\frac{5}{8}$ | $2\frac{1}{8}$ | $1\frac{5}{32}$ | $\frac{3}{8}$ | 30° | " 1 |
| 5 | $1\frac{3}{4}$ | $1\frac{1}{32}$ | $4\frac{1}{2}$ | $1\frac{5}{16}$ | 1 | $\frac{5}{8}$ | $2\frac{1}{8}$ | $1\frac{5}{32}$ | $\frac{3}{8}$ | 30° | " $1\frac{1}{4}$ |
| 6 | 2 | $1\frac{1}{32}$ | $4\frac{1}{2}$ | $1\frac{5}{16}$ | $1\frac{1}{8}$ | $\frac{5}{8}$ | $2\frac{1}{8}$ | $1\frac{5}{32}$ | $\frac{3}{8}$ | 30° | " $1\frac{1}{2}$ |
| 7 | $2\frac{1}{4}$ | $1\frac{1}{32}$ | $5\frac{1}{8}$ | $1\frac{5}{16}$ | $1\frac{1}{2}$ | $\frac{5}{8}$ | $3\frac{1}{4}$ | $2\frac{1}{16}$ | $\frac{3}{8}$ | 45° | " 2 |
| 8 | $3\frac{1}{8}$ | $1\frac{1}{32}$ | 7 | 2 | $1\frac{1}{2}$ | $\frac{5}{8}$ | 4 | $2\frac{1}{16}$ | $\frac{3}{8}$ | 45° | " $2\frac{1}{2}$ |
| 9 | $3\frac{1}{8}$ | $2\frac{1}{32}$ | 8 | $2\frac{1}{4}$ | 2 | $\frac{5}{8}$ | $4\frac{1}{2}$ | $2\frac{1}{16}$ | $\frac{3}{8}$ | 45° | " 3 |

FIG. 1. HANDLE OF BUSHING




| BUSH SIZE | A | B | C | D | E | F | G | H |
|---|---|---|---|---|---|---|---|---|
| To $\frac{1}{4}$ | 0.748 | $\frac{1}{4}$ | $\frac{1}{4}$ | $\frac{1}{8}$ | $\frac{1}{2}$ | $1\frac{1}{4}$ | NO1 | NO1 |
| " $\frac{1}{2}$ | 0.998 | $1\frac{9}{16}$ | $\frac{5}{16}$ | $\frac{5}{32}$ | $\frac{5}{8}$ | $1\frac{9}{16}$ | 2 | 2 |
| " $\frac{3}{4}$ | 1.248 | $1\frac{7}{8}$ | $\frac{3}{8}$ | $\frac{5}{16}$ | $\frac{5}{4}$ | $1\frac{7}{8}$ | 3 | 3 |
| " 1 | 1.498 | $2\frac{1}{8}$ | $\frac{7}{16}$ | $\frac{7}{32}$ | $\frac{7}{8}$ | $2\frac{1}{8}$ | 4 | 4 |
| " $1\frac{1}{4}$ | 1.748 | $2\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{1}{4}$ | $1\frac{1}{32}$ | $2\frac{3}{8}$ | 5 | 5 |
| " $1\frac{1}{2}$ | 1.998 | $2\frac{3}{4}$ | $\frac{1}{2}$ | $\frac{1}{4}$ | $1\frac{9}{16}$ | $2\frac{3}{4}$ | 6 | 6 |
| " 2 | 2.498 | $3\frac{1}{4}$ | $\frac{1}{2}$ | $\frac{1}{4}$ | $1\frac{7}{16}$ | $3\frac{1}{4}$ | 7 | 7 |
| " $2\frac{1}{2}$ | 3.123 | 4 | $\frac{1}{2}$ | $\frac{1}{4}$ | $1\frac{25}{32}$ | 4 | 8 | 8 |
| " 3 | 3.623 | $4\frac{1}{2}$ | $\frac{1}{2}$ | $\frac{1}{4}$ | $2\frac{1}{32}$ | $4\frac{1}{2}$ | 9 | 9 |

FIG. 2. DETAILS OF BUSHING




| NO | A | B | C | D | E | F | G | BUSH SIZE |
|---|---|---|---|---|---|---|---|---|
| 1 | $\frac{3}{8}$ | $\frac{23}{32}$ | $\frac{1}{8}$ | $\frac{9}{32}$ | $\frac{5}{16}$ | $\frac{3}{16}$ 32 | $\frac{1}{4}$ | To $\frac{1}{4}$ |
| 2 | $\frac{7}{16}$ | $\frac{3}{4}$ | $\frac{1}{8}$ | $\frac{5}{16}$ | $\frac{5}{16}$ | $\frac{1}{4}$ 20 | $\frac{5}{16}$ | " $\frac{1}{2}$ |
| 3 | $\frac{1}{2}$ | $2\frac{7}{32}$ | $\frac{1}{8}$ | $\frac{11}{32}$ | $\frac{3}{8}$ | $\frac{5}{16}$ 18 | $\frac{3}{8}$ | " $\frac{3}{4}$ |
| 4 | $\frac{9}{16}$ | 1 | $\frac{1}{8}$ | $\frac{3}{8}$ | $\frac{1}{2}$ | $\frac{5}{16}$ 18 | $\frac{7}{16}$ | " 1 |
| 5 | $\frac{5}{8}$ | $1\frac{7}{32}$ | $\frac{3}{16}$ | $\frac{13}{32}$ | $\frac{1}{2}$ | $\frac{3}{8}$ 18 | $\frac{1}{2}$ | " $1\frac{1}{4}$ |
| 6 | $\frac{11}{16}$ | $1\frac{7}{32}$ | $\frac{3}{16}$ | $\frac{13}{32}$ | $\frac{1}{2}$ | $\frac{3}{8}$ 16 | $\frac{9}{16}$ | " $1\frac{1}{2}$ |
| 7 | $\frac{3}{4}$ | $1\frac{7}{32}$ | $\frac{3}{16}$ | $\frac{13}{32}$ | $\frac{1}{2}$ | $\frac{3}{8}$ 16 | $\frac{5}{8}$ | " 2 |
| 8 | $\frac{13}{16}$ | $1\frac{7}{32}$ | $\frac{3}{16}$ | $\frac{13}{32}$ | $\frac{1}{2}$ | $\frac{3}{8}$ 16 | $\frac{11}{16}$ | " $2\frac{1}{2}$ |
| 9 | $\frac{7}{8}$ | $1\frac{7}{32}$ | $\frac{3}{16}$ | $\frac{13}{32}$ | $\frac{1}{2}$ | $\frac{3}{8}$ 16 | $\frac{3}{4}$ | " 3 |

FIG. 3. SPECIFICATIONS FOR LOCK SCREW

The tabulated dimensions have been worked out by trial and have been found to give excellent results. The handle allows the operator to get a much better hold on the bushing when removing it, than he would get on the knurled head.

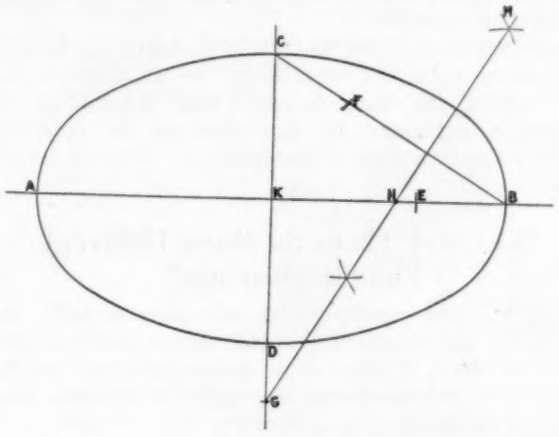
The writer believes that an important point to be considered in present day tool design is to relieve the operator's nervous system of annoying trifles and make all tools and jigs as nearly as possible 100 per cent perfect.

## Laying Out an Ellipse with a Compass

By James H. Yates

A useful method of laying out an approximate ellipse is shown in the accompanying diagram. The curve formed is so near to a true ellipse as to be quite accurate enough for practical purposes. A compass is the only instrument required, with the exception of a straightedge.

To lay out the ellipse proceed as follows: Mark off the major and minor axes *AB* and *CD* for any size of




LAYING OUT AN APPROXIMATE ELLIPSE

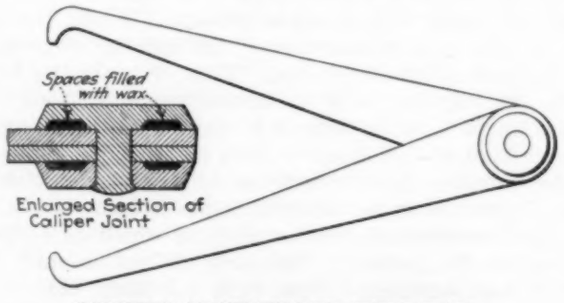
ellipse desired. Join *C* and *B*. With the radius *KC*, strike point *E* on line *KB*. Take the distance *EB* on a compass and mark it off from *C* as *CF*. Bisect *FB* and draw the line *MG* perpendicular to it.

Where this line *MG* cuts the major axis at *H* is the center for the end of the ellipse and where it cuts the minor axis at *G* is the center for the top. It is only necessary to take opposite centers to complete the ellipse.

## Rivet and Washer for Firm Joint Caliper

By G. G. Spicer

Having occasion to make for myself a pair of calipers of the kind known as "firm joint," I turned both the rivet and washer with an annular recess in the under face of each where it would come against the other




RIVETED JOINT FILLED WITH WAX

parts and, before riveting, filled this space with beeswax.

This tool has now been in service for several years and is still as firm and works as freely as when new. I believe this stunt could be applied with advantage to many other places where a similar joint is required.

## Building Flywheels Under Difficulties

By K. Saldis

Apropos of the article under the above heading, published on page 862, Vol. 56, of *American Machinist*, the writer has seen a method of making similar wheels as a regular manufacturing proposition. This method involves the use of no large tools, yet it must be practical or it could not compete with regular machines.

The hub is cast, bored to size, keyseated, and the periphery (of the hub) drilled and tapped for the spokes, which are round rods of wrought iron. After the spokes are all screwed in, the spider is then sent to the foundry where a mold is built up to enclose it and the iron rim is cast in place around the spokes.

The wheel is then mounted on an arbor in a timber frame made purposely for the work, and the rim is trued with a grinding wheel that is mounted on a slide-rest to travel back and forth across the face of the work. The grinding wheel is driven by a separate belt and is provided with an automatic traversing mechanism so timed with reference to the rotative speed of the work that the grinding wheel advances 1 in. sidewise to each revolution of the wheel to be ground. The work speed is about 150 ft. per minute. The grinding wheel is 12 in. wide.

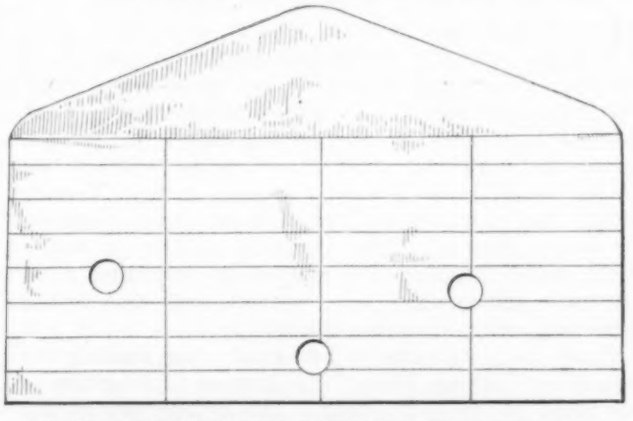
All the attention needed, after the job has been set up and started, is devoted to it by the colored gentleman who sweeps the floor. He comes around (if he happens to notice it) when the wheel stops sparking and gives the feed handle another twist. The boss, of course, decides when a wheel is "done."

If the casting is not particularly bad a wheel 16 ft. in diameter with a 20-in. face can be ground in from 10 to 12 hr. with a labor cost that is almost negligible.

## An Interdepartment Envelope with Windows

By J. Madden

I recently came across what was to me a new type of interdepartment envelope, at the plant of the Cincinnati Milling Machine Co. It is shown in the accom-



AN INTERDEPARTMENT ENVELOPE WITH WINDOWS

panying line drawing, which is about one-third actual size. The unusual feature is that there are three holes punched through both front and back of the envelope. Their size and location make it practically impossible to overlook the contents even though they may consist of very small pieces of paper.

# Editorial

## Give Me All, and I'll Ask No More

IN A STATEMENT which he issued as an answer to some of President Harding's utterances regarding the coal strike, Samuel Gompers said: "The fact is that there is nobody to mine coal until the coal miners now on strike return to the mines. They will return to the mines gladly and quickly as soon as the mine owners *agree with them* (the italics are ours) on terms and conditions of employment."

Of course, they will return to work as soon as the mine owners agree with them. What more could they possibly want? Should not Mr. Gompers have said as soon as mine owners and miners agree? We can only hope that he meant to say so and that the statement, as it stands now, was merely a typographical error of the tongue. We are afraid though that this is not the case. Other utterances of Mr. Gompers have given us the impression that he either believes, or would like to make us think that he believes that the workers must necessarily be right, and that there cannot be room for mutual concessions, mutual sacrifices, mutual revisions of opinions and demands.

The stand of Mr. Gompers indicated by the paragraph quoted is the Hohenzollern stand, the stand of Germany before the war. Germany was perfectly willing to leave other nations in peace and to treat them with the greatest kindness and consideration provided they would agree to the things Germany wanted. This stand of Germany was the cause of the World War. We sincerely hope that Mr. Gompers has learned that such a stand cannot be maintained and we certainly hope that if the quoted passage was not a slip of the tongue, it was not, at least, the expression of the opinion of the majority of laboring men and labor leaders.

## Are Metal Workers Hidebound?

WHY is it that so little research work is done on metal cutting? Surely this matter is of sufficient economic importance to justify the spending of much time, effort and money. An almost unlimited amount of research is justified on the ground that it produces a horsepower with one pound less of steam, possibly two ounces less of coal. Wouldn't it seem natural if more effort were spent on the reduction of power required for metal cutting? The resulting saving in power would reduce the coal consumption, the consumption of tool steel and machine tools besides, and—this is the important point—increase production.

These thoughts came to our mind after reading the article on "Cutting Fluids," by Eugene C. Bingham in our issue of June 29, 1922. The article brings out vividly how little we know about its subject, though it is of the greatest importance to every metal-working shop. And it is only one of the many machine-shop subjects about which our ignorance is monumental. We have been cutting metals for hundreds of years, in thousands of shops and by millions of people, and yet we do practically everything by rule of thumb, and our knowledge is limited to what has been gained by stumbling on some half truth, transferred from one man to the other by word of mouth.

Are metal workers more indifferent, more stupid, more hidebound than steam engineers, electricians and builders, or what?

Isn't this subject big enough to be taken up by some big society or a big university, or all universities? Why should the machine-tool trade depend on the Bureau of Standards to find some of the most elementary fundamentals of its business? Why, and again why?

## Why Are There So Many Different Spindle Bearings?

THERE are certain parts of machine tools that should be standardized and others that wouldn't be a bit better if they were standardized to the last dimension. Standardizing the taper in spindles helps, but it would be of no benefit to any body if the spindles themselves were standardized. Apparently, machine tool builders were aware of the fact that they were free to indulge their tastes and fancies in respect to spindles and their bearings, for it is safe to say that there are at least as many different spindle constructions as there are machine tool shops. As we said, the public is not interested in this matter so long as they are able to exchange tools or arbors. And yet, come to think of it, is this entirely so? Does not the user of the machine have an interest in the spindle construction? Is it reasonable to expect that two different constructions used in similar machines, should be of exactly the same value? It is doubtful that this should be so and it is almost certain that there must be a difference when there are not two but an almost unlimited number of constructions in use. It is almost certain that some must be better than others and very probably that one may be the best of all.

Take the case of the front bearing of the spindle of a milling machine. It is made straight by some, taper by others. It may have a single or double taper or it may be taper with straight collar. The end thrust may be taken up at the rear of the spindle or immediately back of the front box. Then there is the box itself. It may be made of bronze, various kinds of bronze, in fact, or babbitt, or it may be hardened steel or some kind of cast iron. It may be straight or taper on the outside. It is sometimes solid, and sometimes split. It may be located directly in the column (or housing) and sometimes in another bushing which, as a rule, is taper on the outside. The same differences may be seen in rear bearings. Now, it is not likely that any one construction should be just as good as any other, and if we should have to buy a milling machine we would be interested to know which is the best. It would seem that machine tool builders should no longer be satisfied with advertising which construction they use but that they should take the public into their confidence and tell the reason why.

# Shop Equipment News

## Liberty Combination Planer and Slotter for Locomotive Frames

The Liberty Machine Tool Co. of Hamilton, Ohio, has recently developed a machine for completely finishing locomotive frames. The machine is really a combination of a planer and a slotter, the planer side of the machine being shown in Fig. 1 and the slotter side in Fig. 2. The principal advantages claimed for the machine are the saving of floor space, since both slotting and planing are performed on the same machine, and the reduction of the time required for moving the work from one machine to the other and setting it up. The company's standard 36-in. planer forms the major part of the machine. If desired, as many as four heads can be mounted although only one is shown in the accompanying illustrations. The bed is of the box type, and is closed at the top between the *Vs*, which are provided with oiling rollers. The bed is 69 ft. long and the table 38 ft. long and 30 in. wide.

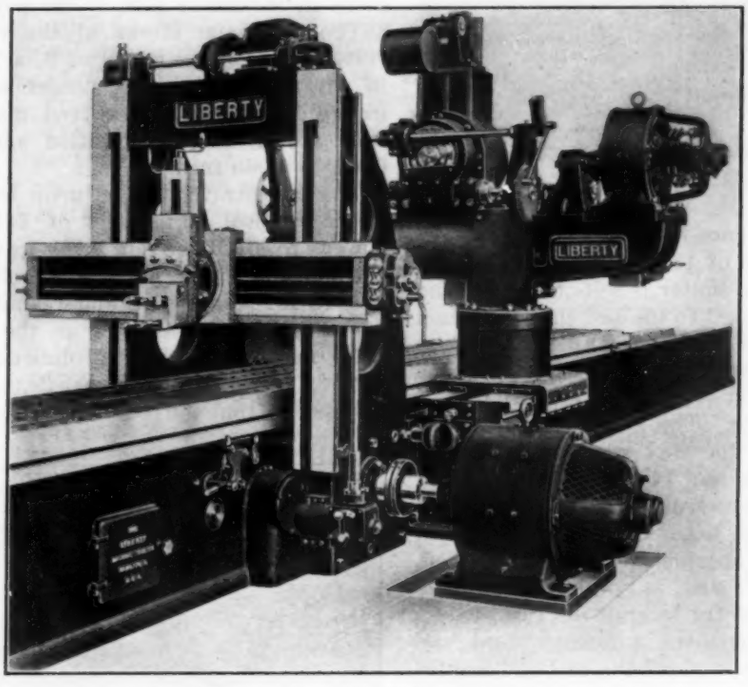



FIG. 1—LIBERTY COMBINATION PLANER AND SLOTTER

The housings are of the box type and extend to the floor. They are attached to the bed by means of large taper plugs and bolts, and are connected at the top by a heavy cross brace. The distance between them is 37 in., which also is the maximum distance between the top of the table and the bottom of the crossrail. This latter member is of box section, and is sufficiently long to accommodate two heads so that either one of them can traverse entirely across the table. The elevating screws are adjustable from the top and are supported on ball bearings.

The heads are graduated to swivel up to 90 deg., and they have automatic feeds in all directions that are operative from either end of the crossrail. When under strain, the down-feed screws are in tension. Micrometer adjustments are provided on all feed screws, and both the saddle and the slide are fitted with binder screws.

The elevating device is centrally located on the top brace. The handle at the side of the housing is employed to operate a saw-tooth clutch when it is desired to raise or lower the cross rail. This handle must be held in position while operating, as the rail stops as soon as it is released or if the rail strikes some obstruction. Side heads can be attached to the machine at any time. These heads are counter-balanced and can be moved below the table top when not in use.

Power for operating the feed is transmitted through a spur gear on the end of the bull pinion shaft, then through a pair of miter gears to the vertical splined feed shaft. The position of a small handle determines whether the feed takes place on the forward or return stroke, and the feed can be disengaged by this same handle. A pair of miter gears on the vertical feed shaft serves to operate the friction device attached to the feed gear on the end of the rail or side head. An adjustable stop operated by a knob determines the amount of feed. Reversible ratchet gears operated by small handles are used instead of trigger gears meshing with a feed gear. All handles and knobs are conveniently located, and all parts are well protected from dirt and exposure.

The operator can control and change the feed of the railheads at any time without stopping the machine or disturbing the feed of either of the side heads. Since the amount of the feed is indicated by a dial, the operator can easily set the feed to the amount suited to the work.

The running gear is placed inside the bed, and is accessible from the top. The gears are pressed on the hubs of the pinions so as to relieve the shafts of torsional strain. The journals of the shafts are supported in wick-oiled bronze bearings. The machine is shown driven by a 15-hp. reversing motor. It can, however, be driven by belt, the pulleys being aluminum with cast-iron centers. The reduction in weight obtained by the use of the aluminum reduces the inertia that becomes troublesome at high speed. The belt-shifting mechanism is entirely inclosed, so that dirt does not enter the moving parts. Shifting levers on both the front and the rear sides of machine enable the operator to control the motion of the table without walking around the machine.

The slotter part of the machine, which is best shown

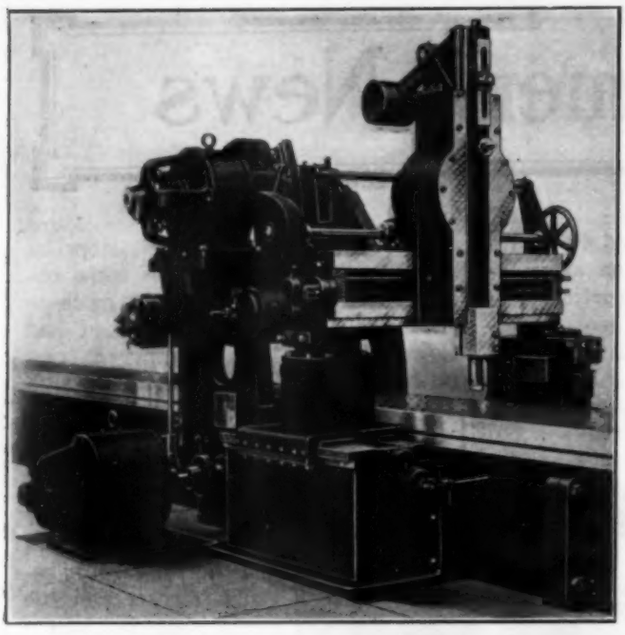


FIG. 2—SLOTTER END OF COMBINATION MACHINE

in Fig. 2, provides a clearance between the housings of 37 in., and under the yoke of 18 in. Work 30 ft. long can be accommodated. The slotter is self-contained, and furnished with a base secured to the bed that permits a travel of 24 in. lengthwise of the machine. The base carries a column upon which the crossrail can be swiveled in either direction when it is desired to slot across the bed at an angle. The slotter crossrail can be swung entirely out of the way when it is desired to use the planer for work that requires the maximum height under the planer crossrail. The left-hand end of the slotter rail rests on a housing which moves in conjunction with the right-hand housing. This left housing has a screw that is used in adjusting the angle of the rail, and also clamps for locking the rail.

The head has an independent automatic feed and rapid traverse both crosswise along the rail and lengthwise along the base. The ram is driven by means of a worm and worm wheel through a crank disk and connecting rod, and it has a stroke adjustable up to a maximum of 14 in. A 10-hp. variable-speed motor mounted on the end of the crossrail drives the ram. Two smaller motors are employed for operating the movements of the rail and head.

When slotting is being done, the table is held stationary. As soon as the cut in one position has been completed, the table can be rapidly moved to the next position by the use of a pendant switch. Attachments can be provided, such as a toolbar which is used for circular feeding or cutting fillets.

The machine has an overall height of 10 ft. 11 in., and occupies a floor space of 10 ft. 2 in. by 78 ft. It weighs 69,000 lb., and 1,000 lb. additional for each extra foot of bed length.

## Hendey 1922 Model 24-Inch Crank Shaper

The Hendey Machine Co., Torrington, Conn., has added to its line the 1922 model, 24-in. shaper shown in the accompanying illustration.

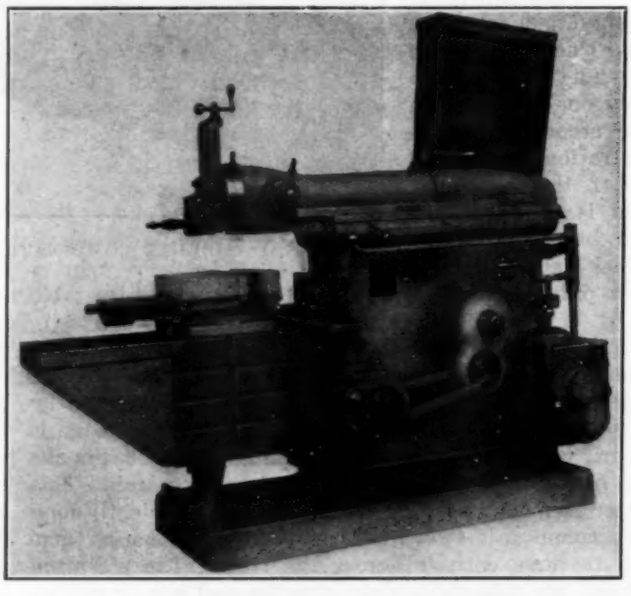
The machine is of the single-belt-drive type and may be driven from the lineshaft or from an independent motor attached to the base. It is provided with the Hendey speed-change gear box giving four speeds, which range is duplicated by throwing in the back gears, making eight speeds in all.

There are but eight gears in the speed-change train and all are of alloy steel, properly hardened, and run in oil. The starting clutch and speed-change levers are within easy reach of the operator, enabling him to make all adjustments without leaving his position.

The clutch is of the double-cone type, acting, when the lever is moved in the reverse direction, as a brake to bring the machine quickly to a stop. Conveniently located index plates show the number of strokes per minute and the approximate cutting speed in feet per minute for which the machine is set, corresponding to the several positions of the levers. There is also an index to show the length of stroke to which the ram is set, and this length may be changed with the machine in motion or idle, at the will of the operator.

The maximum stroke of the ram is 24¾ in. The vertical slide has a travel of 8 in. and may be swiveled to any angle. A single binder screw holds the head in any position. Power feed may be applied to the slide at any angular position and has a range from 0.005 to 0.060 inch.

The table travels 30 in. upon the rail and the latter has a vertical adjustment of 14¾ in. The range of power crossfeed is from 0.008 to 0.180 in. The top of the table is 17x24 in. in size and the vertical face is 17½x18 in. Jig-drilled and reamed holes are provided in both surfaces as well as the usual T-slots. The table may be removed if desired and work attached directly to the face of the saddle, which is provided with T-slots for that purpose. An extension is provided by



HENDEY 1922 MODEL, 24-INCH SHAPER

means of which the top surface of the table may be increased to nearly double its regular length.

The vise jaws are 14½x3 in. and open 16 in. The swiveling base allows the vise to be set at any angle. The driving pulley is 14 in. in diameter, takes a 4-in. belt, and should run at 440 r.p.m. The number of strokes per minute of the ram ranges from 6 to 102. A belt guard of expanded metal is furnished with the machine. The floor space occupied by the machine is 52x107 in., and the net weight is 5,680 pounds.

## Betts-Bridgeford Double-Head Lathe

The illustration shows a Betts-Bridgeford 72-in. double-head engine lathe recently built for the Morse Dry Dock and Repair Co., of Brooklyn, by the Betts Machine Co., Rochester, N. Y. The lathe is intended for turning heavy crankshafts and long propeller shafts, to handle which work the bed has a length of 76 feet.

In order to utilize the machine when it is not required to work on very long shafts, and at the same time provide extra capacity for shorter work, the lathe is provided with a headstock at each end of the bed. It is also equipped with two carriages and two tailstocks. Two lead screws are provided, one on each side of the machine. One screw runs the full length, and the other one-half the length of the bed.

When the lathe is required for extremely long work, one of the tailstocks is removed and the other traversed to a position close to one of the headstocks, thus allowing the use of the full distance between the centers. When the machine is required for shorter work which can be accommodated in a little less than half the full distance between centers, the second tailstock is replaced on the bed and the other traversed to the center, so that the two tailstocks are end to end in the center of the bed. The machine is thus quickly converted into two entirely independent lathes, each swinging work 72 in. in diameter and taking a maximum distance of 27 ft. between the centers. By this arrangement economies of both shop space and first cost may be effected under certain conditions where there is not sufficient unusually long work to keep the machine busy.

The headstocks are both alike in details of construction, being triple back-geared and having heavy bronze bearings throughout. These bearings are chain oiled from individual reservoirs. There are twelve spindle speeds controlled by levers at the front of the headstock, and obtained through sliding hardened-steel gears. A friction clutch and brake operated from the carriage or from the headstock is in the drive of each head.

Power rapid traverse controlled by levers conveniently located at the apron, is provided for both carriages. The carriages and aprons are of heavy construction and provided with compound rests and power angular feed. The aprons are of double-wall unit construction, with all gears of steel and running in oil. The machine is driven by two 50-hp. motors, mounted on the headstocks and having automatic starters.

## Greenfield "Little Giant" Pipe Wrench

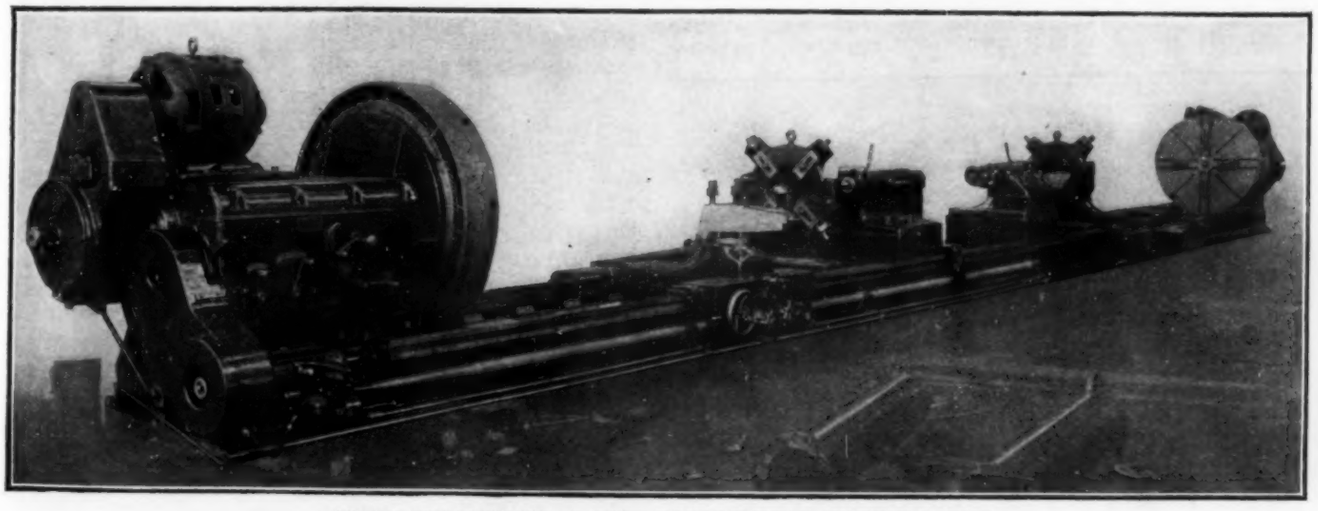
A pipe wrench in which is obtained simplicity of construction and lightness in weight, as well as great strength, has recently been placed on the market by the Greenfield Tap and Die Corporation of Greenfield, Mass. The tool, which is shown in the accompanying illustration, is known as the "Little Giant" pipe wrench. It has the end opening that is commonly employed in machinists' wrenches, which construction enables the wrench to be fitted to pipes located in corners, close to walls, or in confined positions. The operator can set the wrench on the pipe in the same manner as he would a pair of pliers, instead of having to fit the jaws on the pipe from the side of the tool.

The wrench has three parts, a drop-forged and heat-treated handle and jaw made in one piece, a drop-forged and heat-treated moveable jaw, and a hardened steel nut. Although no springs are employed, the wrench

GREENFIELD "LITTLE GIANT" PIPE WRENCH

is said to grip and release quickly and easily. The main jaw is equipped with two sets of teeth, so that the moveable jaw can be engaged with either one of them, and thus lengthen the life of the tool. On the wrenches of 14-in. size and larger, two additional sets of teeth are provided back of the adjusting nut, and the moveable jaw can be reversed to engage with them. This arrangement adapts the tool to certain types of work.

The maker states that the 14-in. size has repeatedly withstood stresses in excess of 4,700 inch-pounds without slipping or bending, although the specifications of the Army and the Navy departments require a strength of only 2,800 inch-pounds for a wrench of this size. However, due to the simplicity of the construction, the wrench weighs less than a Stillson-type wrench of corresponding capacity. The tool is manufactured in 8, 10, 14, 18 and 24-in. sizes.



BETTS-BRIDGEFORD 72-INCH DOUBLE-HEAD ENGINE LATHE

## Pratt & Whitney Odontometer

The Pratt & Whitney Co., Hartford, Conn., has recently added to its line of precision gages a set of instruments for testing gear teeth, known as odontometers.

The odontometer is a simple and self-contained instrument for testing the acuracy or uniformity of the gear tooth profiles and spacings of the teeth in production work. The instrument illustrated in Fig. 1 has a range of from 3 to 10 diametral pitch, may be used to check gears of any pressure angle, and can be applied to a gear while it is in place in the machine.

In effect it is composed of a section of a straight-sided rack with two parallel effective faces, one fixed and the other movable. A third face, set at an angle to the two working faces, is used to hold the fixed working face in contact with the flank of the gear tooth. The fixed registering surface is at *A*, the movable indicating surface at *B*. The third surface *C* holds surface *A* in contact with the involute surface of the gear

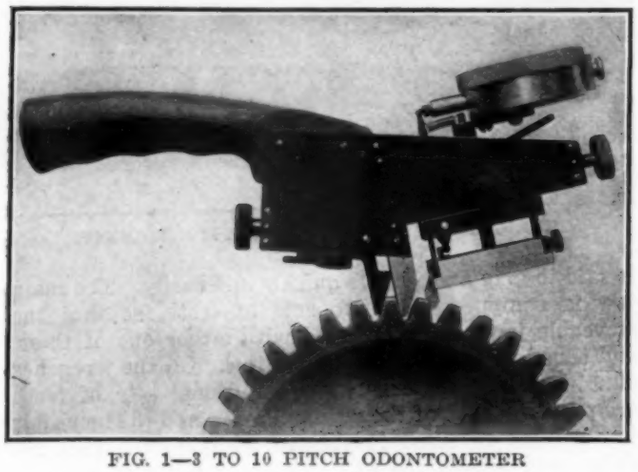


FIG. 1—3 TO 10 PITCH ODONTOMETER

tooth. The surfaces *B* and *C* are adjustable so that gears of various pitches can be tested with the same instrument.

The indicating surface *B* is mounted on two thin flat springs *D*, which act as pivots free from backlash. The dial indicator *E* is actuated by the lever *F*, which has a ratio of 5 to 1, so that each division of the dial represents a movement of 0.0002 in. of the indicating surface *B*.

In general the instrument is used as a comparator to test the uniformity of interchangeable and mating gears. If actual measurements are required, the distance between the two parallel working faces of the instrument can be measured.

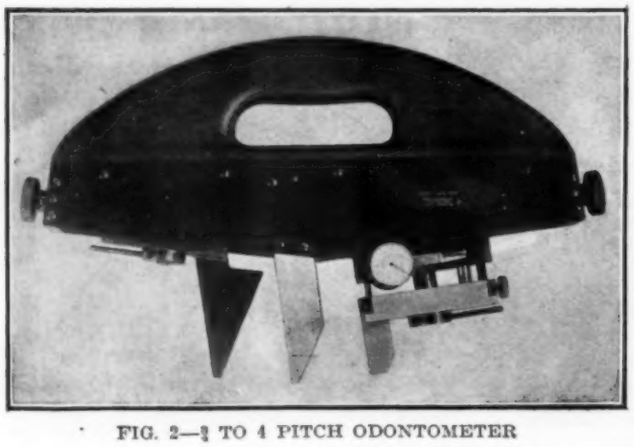


FIG. 2—¾ TO 4 PITCH ODONTOMETER

Odontometers are made to check gears in the following range of sizes: ¾ to 4 pitch, 3 to 10 pitch and 10 to 24 pitch. The largest and smallest sizes of odontometers are shown here in Figs. 2 and 3 respectively.

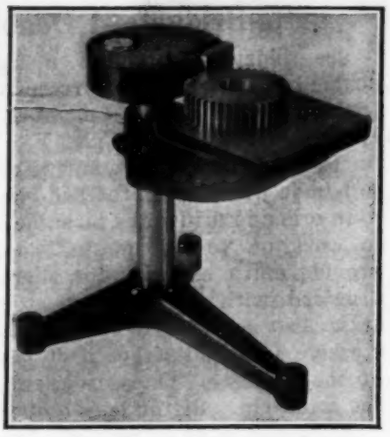


FIG. 3—10 TO 24 PITCH ODONTOMETER, TESTING GEAR ON STAND

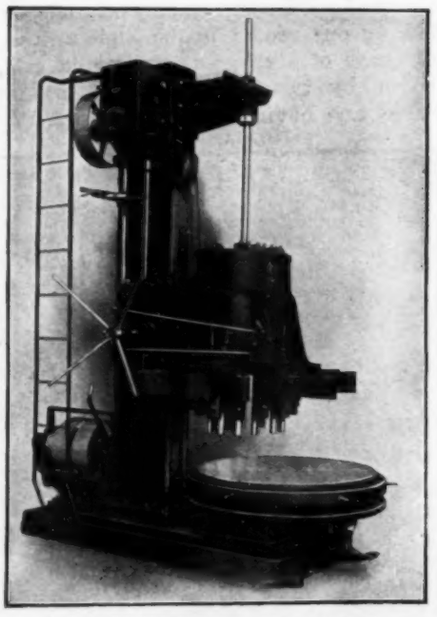
Stands are also made to hold the two smaller sizes of odontometers when gears or pinion shaper cutters are being tested. In this case the gear is placed on a surface plate and rolled by the instrument. The actual cutting edge of cutters can be tested, so that errors, of whatever nature, are detected.

## Changes in Fox D-32 Multiple-Spindle Drilling Machine

The Fox Machine Co., Jackson, Mich., has made some changes in its D-32 multiple-spindle drilling machine described on page 967, Vol. 54, of *American Machinist*.

Among the changes are: An increase in weight and power; the installation of a "Little David" air motor for raising and lowering the drilling head; an interlocking device that prevents the feed from being engaged during the operation of the air control; the addition of a rotary table; base enlarged to support the table, to permit the installation of a motor in place of the clutch and driving pulley and to give more room for the accumulation of drilling compound; drilling head increased from 20 to 25 in. in diameter.

The new rotary table is now arranged for indexing when station drilling is being done. The indexing plunger is withdrawn and the table is elevated by a pedal in front of the machine. The plunger is held out of engagement until the table is brought to the next station, when it is automatically released and enters the recess in the table before the table is lowered The table is elevated on ball thrust-bearings and can be very easily revolved.



FOX D-32 MULTIPLE-SPINDLE DRILLING MACHINE

## Rockford No. 3 High-Power All-Geared Milling Machine

The No. 3 high-power, all-geared, single-pulley-drive milling machine made by the Rockford Milling Machine Co. of Rockford, Ill., was described in its original design on page 377, Vol. 52, of *American Machinist*, and later as re-designed on page 585, Vol. 54. Additional changes in the design have been made, so that the machine appears as shown in Fig. 1. The general characteristics and capacity of the machine are the same as before, although there are refinements and changes in the arrangement of some of the parts.

The principal features of the machine are the rectangular overarm, the method of transmitting the drive for the feed motions to the saddle and table, the support at the side of the column for the knee and saddle, and the power-driven quick-return and rapid-traverse motions. The support at the side of the column for the knee and the saddle need be employed only when taking a cut causing unusually great strain or tending to chatter.

The mechanism for operating the quick return is housed in the small box mounted on the right side of the column. The long lever that extends to the front of the machine controls both the feed and the quick return of the table in both directions. Rapid and easy manipulation is thus possible. The feed control box operates either the longitudinal, transverse or vertical feed and quick return, depending on which machine movement is engaged with the feed gears.

The range of speed is 12 to 350 r.p.m. in 16 steps. There are 12 feed changes providing from ½ to 16 in. per min. feed. Among the minor changes that have been made in the machine are the following: The overarm is now 4½ x 9½ in. in section, the distance from the center of the spindle to the bottom of the overarm is 7¾ in., and the hole through the spindle is 1¾ in. in diameter.

Constant-speed drive is employed, the 16-in. pulley being ordinarily rotated at 320 r.p.m. When individual motor drive is used, a 7½-hp. motor running at 1,200 r.p.m. is supported on the back of the column. The net weight of the machine equipped for belt drive as shown in Fig. 2 is about 8,000 lb. This view shows also the levers for changing the speeds and feeds. The speed gears are in the top compartment, the feed gears in the middle one, and a coolant tank below.

The machine can be fitted with a number of attachments, which have been developed to adapt it to special work. The universal milling and drilling attachment can be fastened on the face of the column. It has two heads, one at the point of junction with the machine spindle, and the other at right angles to the spindle at the end of the attachment. The spindle of the attachment has a feed of 5 inches.

The 12½-in. dividing head shown mounted on the table of the machine is provided with two index plates that can be used in performing all the indexing formerly done with three plates. A power-driven rotary table driven from the mechanism in the knee can also be provided. The worm drive of the table has the same gear ratio as that of the dividing head, so that an index plate can be transferred to the table, and indexing done in the same manner as with the dividing head. The dial is graduated to minutes, so that the table can be accurately set.

A vertical milling attachment can also be provided. It is driven from the spindle of the machine, and is secured over the end of the overarm so that it can be rigidly held. A slotting attachment can be attached in the same manner. For performing vertical work in quantities, a vertical head can be bolted to the top of the column after the overarm has been removed. In this way, a rigid vertical milling machine differing from the standard one only in the fact that it has a horizontal spindle also, is obtained. The clearance from the center of the vertical spindle to the column is normally 15 in., although it can be made 20⅜ in. when additional capacity is necessary.

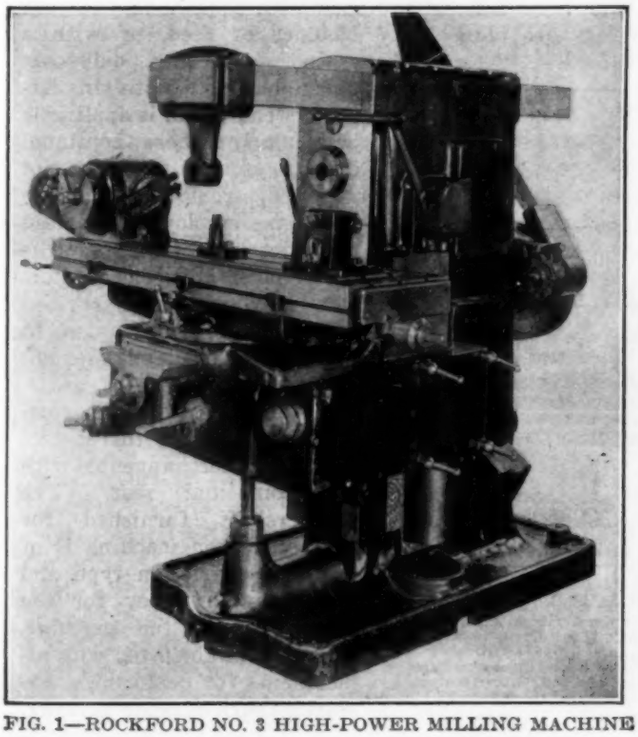


FIG. 1—ROCKFORD NO. 3 HIGH-POWER MILLING MACHINE

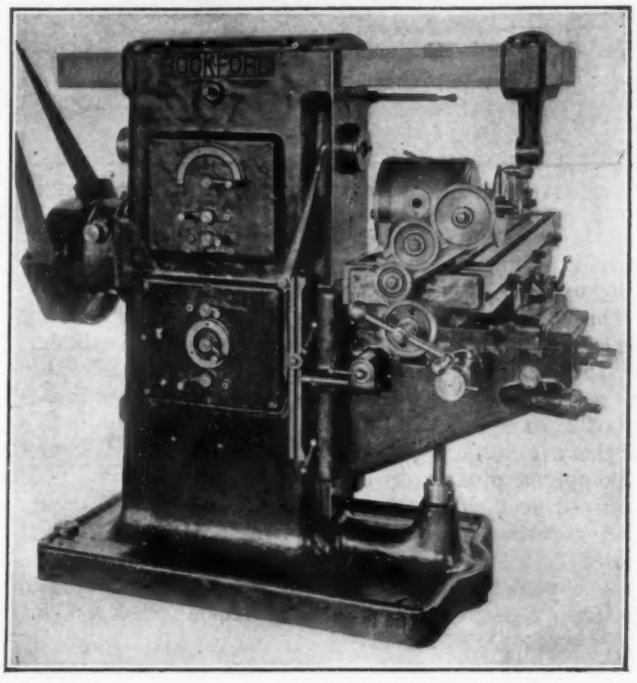
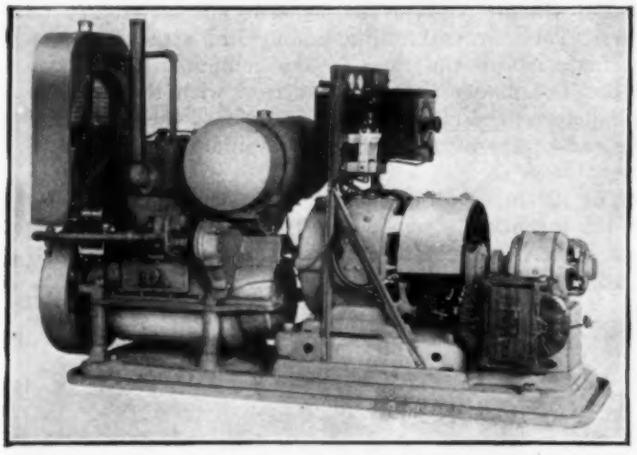



FIG. 2—GEAR SHIFTING SIDE OF ROCKFORD MILLING MACHINE

## Westinghouse Engine-Driven Welding Equipment

The accompanying illustration shows an outfit that has recently been put on the market by the Westinghouse Electric and Manufacturing Company of East Pittsburgh, Pa., for generating the current required in electric welding, using a gasoline engine as the source of power. The equipment is applicable to use where



WESTINGHOUSE ENGINE-DRIVEN WELDING EQUIPMENT

electric power for motor drive is not available, and since it is entirely self contained, it does not require any auxiliary apparatus or connections.

The equipment consists of a single-operator welding generator geared to a Doman four-cycle, two-cylinder, low-speed, marine-type gasoline engine. The generator has a rated capacity of 175 amp., and a maximum capacity of 225 amp. at 1,750 r.p.m. It is designed to operate at the arc voltage required, to stabilize the arc, and to supply a practically constant current of any value required over the working range from 90 to 225 amp. The operating characteristics of the generator adapt it especially to welding, so that it is easy for the operator to strike and maintain the arc and also to obtain the deep penetration and thorough fusion desirable for welding. The shaft of the generator extends through the pedestal bearing, and is connected by means of a flexible coupling to the exciter.

The engine is made heavy throughout, so as to withstand continuous service. The cylinder block and its removable head are made of semi-steel. The engine is provided with a force-feed system of lubrication, a Wheeler-Schebler carburetor, a Taco throttle governor, an impulse starter and a honey-comb-type radiator.

The control panel is mounted directly over the generator on an angle iron frame, and the entire equipment is mounted on a cast-iron bedplate. The outfit is made in both stationary and portable models, to adapt it to the type of service required.

## Springfield 24-Inch Geared-Head Engine Lathe

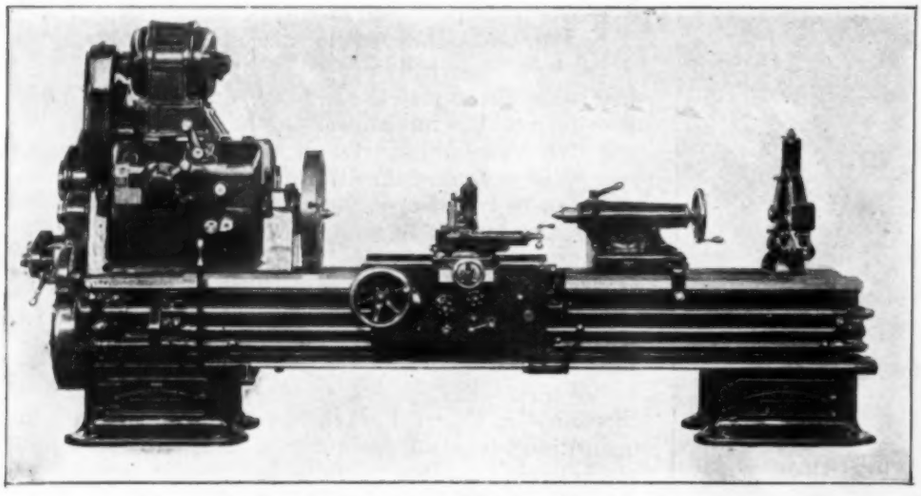
The Springfield Machine Tool Co., Springfield, Ohio, has recently placed on the market a 24-in. size of the all-geared-head engine lathe that was described in the 14, 16, 18 and 20-in. sizes on page 514, Vol. 48, of *American Machinist*. The 24-in. lathe is shown in the accompanying illustration equipped with a motor drive, cabinet legs at each end of the bed, steadyrest and other attachments.

The gears in the headstock run in oil, and all journals, excepting those on the main spindle, are equipped with ball bearings. A ball thrust bearing is employed. The head is of the selective type. It may be driven directly from the lineshaft, and it is so constructed that a motor may be mounted on top of it at any time. Fourteen gears are employed to obtain the twelve speeds.

The main drive pulley contains the friction clutch, which can be operated either from the right-hand side of the apron or from the push rod overhead. A friction drag is provided so that the spindle can be quickly stopped. All of the power-transmitting shafts in the head are short and of large diameter, so that heavy duty is possible. The operating levers are conveniently grouped at the front of the head.

The lathe may be equipped with a quick-change-gear system providing forty changes of feed, or with a system providing only six quick changes. With this latter system, which is applicable particularly where continual change of the pitch is not required, removable change gears are employed to obtain the exact feed necessary. The apron is of box construction. The half-nuts are provided with a locking mechanism to prevent their engagement when the feeds are in use.

Different types of compound, plain and turret tool posts are interchangeable with the compound rest. The countershaft furnished for the belt-driven machine is of the double friction type and has a single pulley for the down-drive to the machine. The lathe can be fitted with attachments for performing operations such as taper turning.



SPRINGFIELD 24-INCH GEARED-HEAD ENGINE LATHE

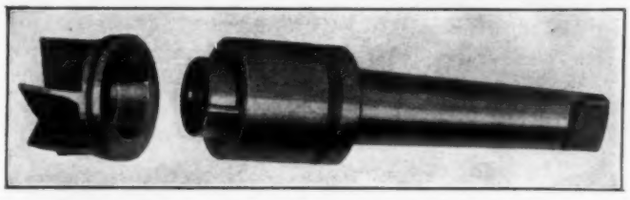
Specifications: Swing: over bed, 25¼ in.; over carriage, 17 in. Distance between centers with 8-ft. bed, 28⅝ in. Spindle: through hole, 2⅝ in.; diameter of nose, 4¼ in.; threads on nose, Acme 4 threads per inch. Spindle speeds: number, 12; range, 8.84 to 280 r.p.m. Feeds: number, 40; range, 2 to 143 rev. per inch. Threads, 1 to 28 pitch. Taper of centers, No. 5 Morse. Size of tool, ⅝ x 1¼ in. Taper, up to 4 in. per ft. and 27 in. long. Motor recommended: horsepower, 5; speed, 1,200 r.p.m. Weight with 10-ft. bed: net, 8,650 lb.; domestic shipping, 9,300 lb.; per additional foot, 250 lb. Export box, 202 cu.ft.

## West Pin Drive for Small Tools

The West Sales Co. of Detroit, Mich., has recently placed on the market a line of small tools manufactured by the Hanson Tool and Die Co., also of Detroit. The line comprises such tools as end mills, keyway cutters, counterbores, countersinks, two- and four-fluted drills and connecting-rod tools. Special holders are provided to suit the different types of cutting tools, the accompanying illustration showing the Type B counterbore and its holder. The cutters are made of high-speed steel and the holders of an alloy steel.

The milling cutters can be furnished in a large range of sizes, to suit the work. The reamers may be either straight or helical fluted, the drills two- or four-fluted, and the countersinks of either 60- or 80-deg. angle. The drilling, reaming and counterboring tools are particularly intended for short holes. The body of the holder serves as a pilot, so that the cutting tool is required to do cutting only.

The holders can be supplied in a large range of sizes and with any type of shank needed to suit the machine. In the counterbore shown a short shank on the holder



WEST PIN DRIVE ON COUNTERBORE

slips into a hole in the counterbore itself, although for the drills, reamers and most of the tools a small tapered shank on the cutter slips into the hole in the bottom of the holder. The counterbores can be provided with the desired size of pilot at the forward end.

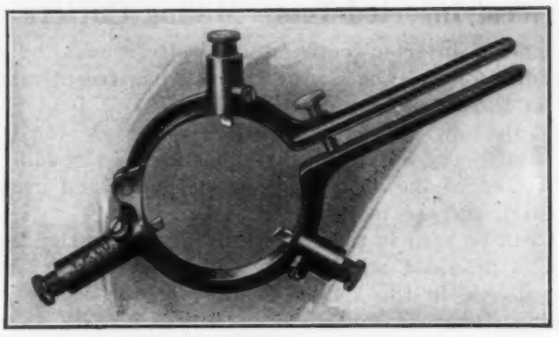
The cutter is prevented from turning in the holder by a small pin placed lengthwise in grooves in the inside and outside tapers. The construction provides a positive drive that enables the tools to run accurately and permits the use of a small shank. The tools are particularly adapted to turret work, and holders can be furnished for any style of turret.

## Vedoe-Peterson Piston-Groove Cleaner

In order to facilitate the cleaning of carbon from the grooves for the compression rings in automotive pistons, the Vedoe-Peterson Co. of Norfolk Downs, Mass., has just placed on the market the "V-P" groove cleaner that is shown in the accompanying illustration. The use of a scraper for this work is thus eliminated, so that the cleaning can be performed in a very short time.

The piston which is to be cleaned is usually held on a bar passed through the piston pin hole and clamped in a vise. The hinge in the frame of the holder allows the device to be placed over the piston, so that the cutters rest in one of the ring grooves. The three cutters are adjusted to the approximate depth of the groove by means of the screws that back up each cutter. They are then locked in place by the small setscrews. The final adjustment so that the tools fit the bottom of the groove, is made by means of the knurled screw that holds the two parts of the handle together.

It is necessary to rotate the cleaner only two or three turns to completely remove the carbon. Two sets



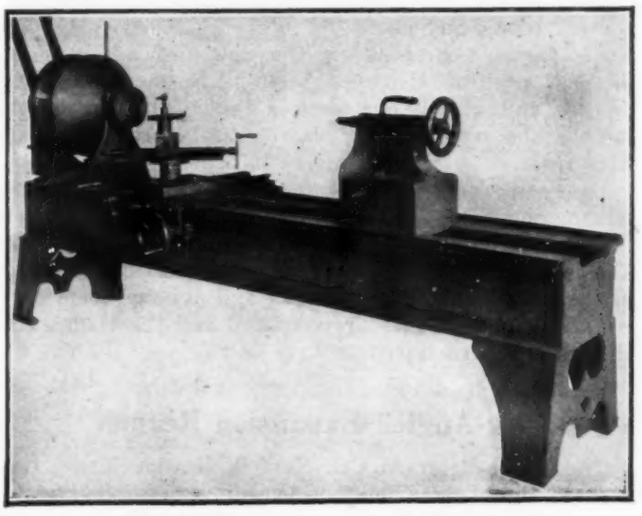
"V-P" PISTON-GROOVE CLEANER

of cutters are furnished with each cleaner, one for grooves $\frac{1}{8}$-in. and the other for grooves $\frac{1}{4}$-in. in width. The cleaner is adapted to use on pistons from 3 to 4 in. in diameter.

## Buffalo Gear and Pattern Works Patternmaker's Lathe

The patternmaker's lathe illustrated herewith has recently been placed on the market by the Buffalo Gear & Pattern Works, 16 to 20 Elk St., Buffalo, N. Y.

The lathe will swing 32 in. over the shears, 24 in. over the carriage and take 6 ft. between centers. The headstock can be swiveled 90 deg., converting the machine into a face lathe, the plane of the work being parallel with the bed. When used as a face lathe, a three-legged horse is provided having a base thereon



BUFFALO GEAR AND PATTERN WORKS PATTERNMAKER'S LATHE

to which the compound rest can be attached, after removal from the carriage. The horse also serves as a seat for the operator.

Changes in speed are made by opening and closing two pairs of interlocking bevel-faced pulleys, one pair of which is located on the headstock and the other pair on the countershaft. Levers toggled to the shifting lever close one pair of pulleys while they open the other pair, the action being almost identical with that in the Reeves speed-changing countershaft. Closing the pulleys increases the effective diameter while opening them decreases it. A belt of triangular section is used and as the interlocking teeth of the pulleys are of wood, it is claimed that no damage results to the belt.

## West Inserted-Tooth Milling Cutters

A line of inserted-tooth milling cutters made by the Hanson Tool and Die Co. of Detroit, has recently been put on the market by the West Sales Co., 1013 Ford Bldg., Detroit, Mich. The cutters are made for both light and heavy duty, and for side, face or slot milling. The bodies of the cutters are of hardened and ground tool steel, and the teeth of high-speed steel.

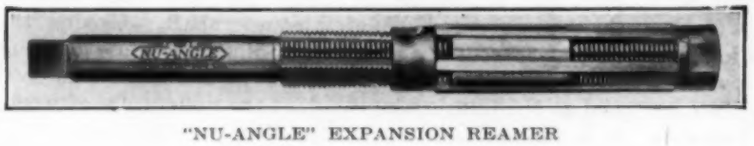
As can be seen in the accompanying illustration, each tooth is provided with a tapered shank that fits in a tapered hole in the body. To prevent the tooth from turning, one or more small pins fitting in grooves in both the shank and hole are employed. All types of the cutters can be furnished in a range of sizes. When desired, the size of a cutter can be permanently maintained, even after sharpening. For a plain cylindrical cutter, the outside of the body is made in spiral form with the diameter increasing slightly from one point entirely around the cutter. Thus, some of the blades are longer than others. To sharpen the cutter, the shortest blade is removed and each blade moved forward one position. One new tooth is placed in the last position that has been made vacant by the process, so that only one tooth is discarded. The cutter can then be ground to the size it was before the blades were reset.

WEST INSERTED-TOOTH MILLING CUTTER

This same principle is employed on slot-milling cutters having teeth on both faces, so that the width of the slot can be kept the same after grinding the cutters. The teeth can be easily removed by inserting a wedge in the holes beneath the shanks and driving them out. No screws nor wedges are required and the blades are all of a standard type.

## "Nu-Angle" Expansion Reamer

The Vedoe-Peterson Co., Norfolk Downs, Mass., has just brought out the "Nu-Angle" expansion reamer that is shown in the accompanying illustration. As the name indicates, the blades are placed at an angle to the axis of the reamer, which construction facilitates reaming holes having oil grooves and ridges. The position of the blades in the body gives a slight back rake to the front face of each blade at the forward end of the reamer. Near the center of the blades the front faces become radial, while they are slightly under-cut at the following end of the tool. The construction makes the reamer adaptable to use on either bronze, steel or cast iron, and is stated to give a smooth finish.




"NU-ANGLE" EXPANSION REAMER

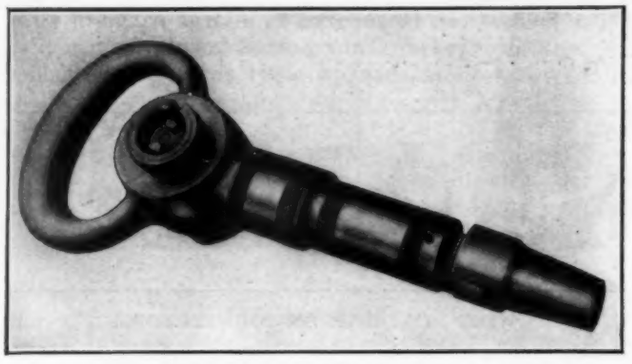
The size of the reamer is adjusted by means of the nuts at the ends of the blades. Since the blades have only straight relief, they can be sharpened on an ordinary tool grinder without taking the reamer apart.

The reamers are made in eleven sizes. The smallest has a minimum diameter of $\frac{15}{16}$ in. and a maximum diameter of $1\frac{1}{16}$ in., has blades $1\frac{1}{16}$ in. long, and is $5\frac{3}{4}$ in. overall in length. The largest has a diameter adjustment from $1\frac{1}{16}$ to $1\frac{3}{16}$ in., has a $4\frac{1}{2}$ in. blade length, and is 12 in. overall in length. The reamers can be supplied singly or in sets packed in wooden cases.

## Changes in "Titan" Pneumatic Tools

Since the description of "Titan" pneumatic tools on page 1015, Vol. 53, of *American Machinist*, the following changes have been made in their construction.

The valve sleeves and all port holes in the sides of the tools have been eliminated, so that instead of regulating the air by opening and closing the ports, a constant passage of free air is forced through the entire tool between the inner and outer casings.



"TITAN" PNEUMATIC TOOL

These changes greatly simplify the construction of the tool and prevent the former objectionable heating of the outside casing.

The illustration herewith shows one of the tools since the above noted changes have been made. The tools are now made and marketed by the Titan Power Hammer Corporation, 25 West Broadway, New York.

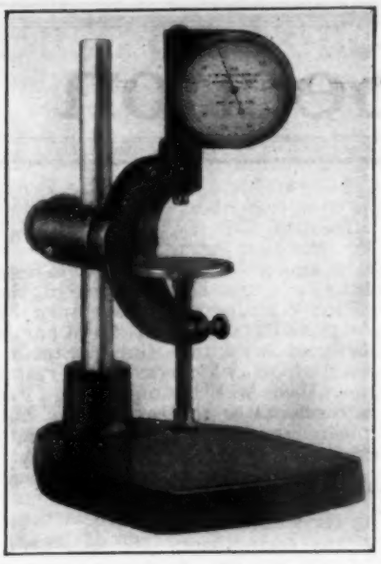
## Horstmann Swivel-Head Indicating Caliper and Stand

On page 917, Vol. 50, of *American Machinist* there appeared a description of an indicating caliper made by the F. W. Horstmann Co., 196 Coit St., Irvington, N. J. A caliper of similar type but provided with a swiveling head, as shown in the accompanying illustration, has just been placed on the market by the same concern. The head swings through a complete circle about the plunger, so that its position can be adjusted to enable easy observation. The head will stay fixed in any position without the necessity of clamping it.

The instrument is used in the same manner as the caliper previously described, being set to the desired size of the work. Since the dial is graduated in thousandths of an inch, variations in the size of the pieces from standard can be easily observed. The tool is made in six sizes from 1 to 6 in. in capacity, each size having a range of 1 inch.

The stand in which the tool is shown

clamped in the accompanying illustration may be provided to facilitate gaging work of comparatively large size, so that the operator need not hold the caliper in his hand. The stand normally requires no fastenings, but for very large work it can be secured to a bench or table. The caliper may be clamped in the stand in either a straight or a tilted position, and is held perfectly rigid. Larger anvils may be furnished to use the caliper and stand.

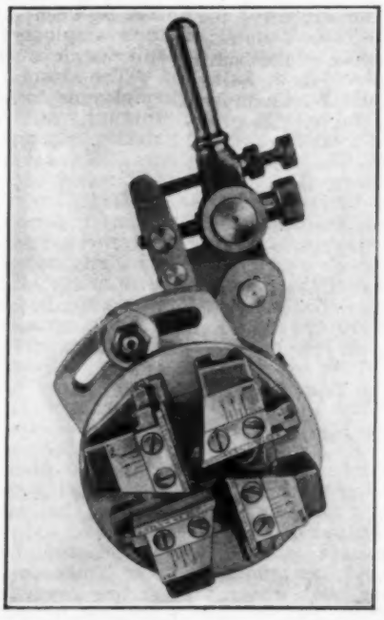


HORSTMANN SWIVEL-HEAD CALIPER AND STAND

## Landis Stationary Die-Head with Micrometer Attachment

The Landis Machine Co., Waynesboro, Pa., has recently placed on the market a stationary type die-head with micrometer attachment as shown in the illustration herewith. With the micrometer attachment it is possible to set the die-head so that in taking one or more roughing cuts, the same amount of metal will be left for the finishing cut on each piece.

Graduations for all sizes of bolts and pipe within the range of the die-head are stamped on the outer surface of the closing ring. After the die-head has been adjusted to size, by means of the graduations, and locked as far as that adjustment is concerned, further and finer adjustment can be made by use of the micrometer screw. An adjustable stop screw is provided so that after the micrometer adjustment for the finishing cut has been made, finishing cuts can be taken after roughing cuts, accurately repeating the size. The die-head can be applied to lathes, hand operated screw machines and other types of machines where the work is revolved while the threading head remains stationary. For attachment to screw machines or turret lathes the die-head is equipped with a shank to conform to the dimensions of the holes in the turret. For use on engine lathes, a special bracket is required. If the work is placed on centers a special dead center is needed.

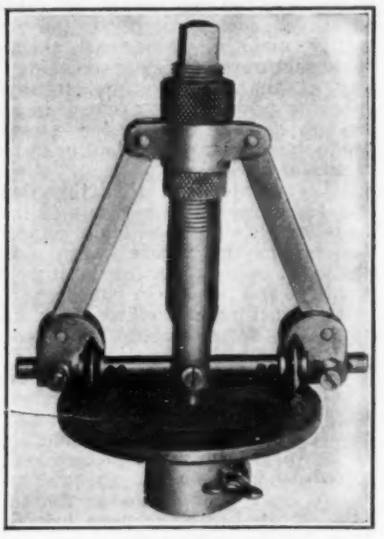


LANDIS MICROMETER DIE-HEAD

## Butterfield "E-Z" Circle Cutter

The small tool shown in the accompanying illustration is intended for cutting round holes from 1 to 3¾ in. in diameter in sheet material such as paper, fiber, rubber, leather and metal up to $\frac{1}{8}$ in. in thickness. It has recently been placed on the market by the M. A. Butterfield Co., 12 June St., Lowell, Mass., and is designated as the "E-Z" circle cutter.

The two cutting wheels are so mounted on a hardened spindle that the distance between them can be adjusted to the diameter of the circle that it is required to cut. The spindle and the cutters are supported by two braces, the positions of which can be moved by the knurled nut threaded to the shank so as to adjust the distance between the cutters. The feed pressure is obtained by means of a nut which engages with the supporting plate through a ball thrust bearing. The device is furnished with an extra plate and a short spindle to enable cutting holes close to a corner. This arrangement is particularly useful when enlarging openings in switch cabinets and outlet boxes. All the steel parts of the tool are hardened. The tool is ordinarily furnished with a ½-in. square shank, so that it may be driven by means of a ratchet wrench or a bit-stock attachment.



"E-Z" CIRCLE CUTTER

The device is ordinarily driven by hand, but it can be turned by power, if it is available. The tool is light in weight and compact, and can be easily carried about the shop.

## The Foreman and Production

BY C. E. JENSEN

In dealing with a production group, we find that unless the foreman understands all the factors making up successful and profitable production, and is able to impress that fact upon his workers without apparently taking the trouble to do so, he will not make a success of his position. His workers must look up to him in technical matters. Otherwise, they will look at him out of the corners of their eyes, which means disrespect, an unwilling obedience and a disregard of advice —if not actual disobedience.

The foreman's biggest job is not the understanding and handling of the machinery, the materials or the workers. Nor does it lie in understanding the methods by which these are utilized to the best advantage of all concerned—including the community. But his biggest job is the understanding and handling of his own personal equipment for his job. It is knowing his possibilities and his limitations and how to utilize the first to the fullest and how to counteract the latter. This he may learn by self analysis and study, and sometimes by the help of "friend wife."

# News Section

## Turkey Needs American Machinery

From the American Chamber of Commerce for the Levant, in a special message, comes word of the opportunity awaiting American machinery manufacturers. Of vital need to Turkey at the present time, it says, is machine power. As a consequence an urgent demand exists for American-made tractors and agricultural implements of all kinds.

It is pointed out that this demand has been created as a result of the exhaustion of the available supply of animals in the recent wars, most of the draft animals having been used for cavalry and artillery purposes. American tractors, as well as other American-made farm machinery, possess a fine reputation in Turkey, it is stated.

The opportunities for the development of the Anatolian, Thracian and adjoining markets for argicultural machinery and implements are considered to be very good. Exporters here are urged to give serious thought to the entire Near East trade, as the time is now reported as being peculiarly opportune for developing this business. No duty is charged for the admittance of agricultural machinery into Turkey.

## Railroads Plan Large Equipment Purchases

The Interstate Commerce Commission, according to reports from Washington, has just granted permission to the Boston and Maine Railroad Co. to carry out its plans for acquiring $3,049,700 of new equipment, consisting of twenty-two switching engines, two road engines, sixty-five steel baggage coaches, twenty steel smoking cars, eight steel baggage and smoking cars, five steel baggage and mail cars and twenty-five milk cars, passenger-equipped. The steel cars are a start toward complete elimination of wooden or composite passenger equipment from that road.

To carry out the plan the commission authorized the company to issue $1,815,000 of equipment trust certificates at 5.5 per cent interest, payable semi-annually. The Government is to lend the company $1,212,500 to enable it to make the necessary cash payment on the equipment.

It is also reported that application has been made to the Commission by the Seaboard Air Line for permission to issue $2,450,000 of 6 per cent equipment trust certificates, the money to be used in part payment of 900 new steel underframe ventilated box cars; 100 new all-steel phosphate cars; 1,000 rebuilt steel underframe box cars and four all-steel dining cars.

The company has also asked permission to issue to the extent necessary of junior equipment trust certificates, to obtain the release of rebuilt equipment from the lien of mortgages or equipment trust agreements now encumbering them. The arrangement for rebuilding the cars in question was approved several months ago.

Many other applications are now before the Commission in Washington from various railroads throughout the country. In the majority of cases the funds from the issues upon which authorization is being asked will be used either in road betterments or the purchase of new equipment.

## Machine Tool Merger

The work of merging certain machine tool companies which has been under way for several months past was finally completed on Wednesday, July 19 and formal transfer of the individual companies to the new corporation, known as the Consolidated Machine Tool Corporation of America, was effected.

The new organization was incorporated under the laws of the State of Delaware in June, 1922, and is composed of the following individual units:—

Betts Machine Co., Rochester, N. Y.; Ingle Machine Co., Rochester, N. Y.; Hilles & Jones Co., Wilmington, Del.; Modern Tool Co., Erie, Penn.; The Newton Machine Tool Works, Inc., Philadelphia, Pa.; The Colburn Machine Tool Co., Cleveland, Ohio.

The Dale Machinery Co. of New York and Chicago of which John J. Dale is president, has also been taken over by the new combination.

The executive heads, who were also the owners of the companies forming the consolidation and who were responsible, in a great measure, for their success in the past, will remain as active executives and directors of the new company with the addition of C. K. Lassiter as president and W. H. Marshall as chairman of the board of directors.

As now made up the executive personnel and directorate is as follows:—W. H. Marshall, Chairman of the board; C. K. Lassiter, president; H. J. Bailey, H. W. Breckenridge, H. W. Champion, J. J. Dale and A. H. Ingle, vice-presidents; O. D. Miller, treasurer; R. R. Lassiter, secretary; W. H. Marshall, C. K. Lassiter, H. J. Bailey, B. J. Baker, H. W. Breckenridge, Lawrence Chamberlain, H. W. Champion, J. J. Dale, T. Allen Hilles, A. H. Ingle, F. D. Payne, directors.

The executive offices of the new corporation will be in the National City Bank Building, 17 East 42d St., New York City.

## Automobile Tire Production Establishes Record

The production of rubber tires for the month of June, according to preliminary reports, indicates a new monthly record established, with an output of 3,500,000 casings. This compares with May production of 3,000,000, a production approximately 10 per cent under the record month of August, 1921.

## Support for President Asked by Chamber of Commerce

Business organizations of the country within the past week have been called upon by the board of directors of the Chamber of Commerce of the United States to take such leadership as will crystallize public sentiment in upholding President Harding in the exercise of his authority for the maintenance of uninterrupted railway transportation. At the same time the Board has commended President Harding's statement making clear the issues involved in the strike, and has urged the Administration to use all the power of the agencies of the government to the end that the supremacy of the law be maintained. The President has been informed of this action of the board in a letter written by Julius H. Barnes of Duluth, president of the Chamber. Mr. Barnes has named Harry A. Wheeler, of Chicago, to deliver the letter to the President.

The declaration of the Board, as set forth in the letter, follows:

"The Board of Directors of the Chamber of Commerce of the United States commends the statement of President Harding making clear the issues involved in the Railroad Shop Crafts Strike. We believe in the peaceful settlement of controversies and due respect for agencies established by law or mutual agreement for securing just and impartial decisions. We believe in the compliance with such decisions by both parties and that the public will trust decisions so arrived at as generally fair and accord them support.

"This strike of a section of railroad employees is against a decision of the Government's own agency.

"That agency is continuously in session to carefully consider and fairly decide in the public interest controversies between railroad management and their employees relating to wages and salaries or working conditions.

"The attempt of the striking railroad employees to enforce their own views through methods of industrial war should meet the condemnation of all who believes in orderly processes of settlement.

"This country is slowly emerging from a period of unemployment and severe business depression, and cannot patiently view any unlawful interference with its transportation facilities, retarding its industrial recovery.

"We commend the President for his determination to maintain the supremacy of the law and we urge the Administration to use all the power of the agencies of the government to that end.

"We call upon the business organizations of the country to take such leadership as shall crystallize public sentiment in upholding the President in the exercise of his authority for the maintenance of uninterrupted railroad transportation and for such local protection and community public order as will secure every man his right to work without intimidation."

# Business Conditions in England

By OUR LONDON CORRESPONDENT

The three months dispute with the engineering workpeople ended in an agreement which gave the employers much that they wanted. As to overtime, the employers have the right to decide when this is necessary up to a limit of 30 hours a month. In regard to any changes in shop processes or practice, where alterations mean the general displacement of workpeople of one class by people of another class, the employers undertake to give not less than 10 days notice of their intention to change, and also to provide an opportunity for discussion, unless circumstances are beyond their control. Where workpeople cannot protest until after the event and the protest is upheld, the decision, as far as payments go, is to be retrospective to the date of protest. For three weeks or so, work has been resumed in the federated shops.

### Inquiries More Numerous

Not in every case has it been possible to take on as complete a complement of workmen as had been employed before the shops were shut, and this fact helped to cause, at first, somewhat of an increase in the numbers of unemployed registered officially, as men were then entitled to make claims which are not tenable if made by locked-out workers. However, since then further falls have been reported. According to the latest figures, the numbers claiming State unemployment benefit amount to 1,404,900 or, about 420,000 less than at the beginning of the year, while 105,900 are working short time and drawing benefit for intervals of unemployment.

The raw material market at the end of the dispute showed no particular additional animation, so that no immediate revival was anticipated. The same remains true now except that confidence is growing and, according to recent reports, not only are the home railway companies ordering rolling stock but Indian railways are also in the market for similar equipment.

For iron and steel, British prices are held in many respects to compare quite favorably with those of the continent, especially, as in Germany, increases in prices have been reported. The effect on the machine tool industry has yet to be seen. Certainly any improvement is but slight, and although there have been one or two complaints, more particularly from the Glasgow area, there is little evidence of the sale of German tools. In fact, those who are endeavoring to get the machine tool industry entered under part two of the Safeguarding of Industries Act, have failed so far. The fact is that though German tools are on offer very few are sold.

Tool inquiries have seemed to be more numerous or nearer to business of later but "man never is but always to be blessed," and it is now thought generally that the British engineering industry cannot revive unless the war wage bonus is removed. Some firms, at any rate, are holding off in the hope that prices will fall, and machine tools are not so urgently needed that delay is fatal.

The small tool trade has remained relatively bright, and one of the leading firms has just started to sell direct from a sort of traveling stores in the shape of a self-propelled vehicle pretty completely stocked. On the other hand, another English firm, that lately took up the manufacture of small tools will, according to rumor, be dropping them before long. One or two firms of manufacturers' agents are adopting a somewhat new method of setting apart a special room with tables on which are displayed samples of all, or at any rate many, of the small tools, etc., in which the firm deals. The idea is that the customer can come and look over the exhibition, for that is what it amounts to, and then place orders which will be filled from stock. Only one sample of each appliance is shown, so that the exhibition cannot be drawn on for direct supplies.

As was forecast in these columns some time ago, a London firm of machine tool dealers has now opened up as restaurant proprietors, and what were, until recently, show-rooms and offices are now kitchens and dining halls. Already it is the rendezvous of the machine tool people of the district. Among manufacturing firms one machine tool house is solely occupied in the machining of motor car details. Another has included equipment for the farm among its output, while a third is largely engaged on engineering repairs and the production of household utensils. Yet another is engaged on bread-cutting and buttering machines, while one well-known agent has not sold a tool since September last according to his own statement, and a certain firm of machine tool merchants is reported to have received its last order more than three months ago. These may not be fair examples, yet it must be admitted that the machine tool industry, taken as a whole, is anything but prosperous.

### Serious Effect of Strike

As already indicated, not all the workpeople who were locked out were able to resume operation immediately after the dispute was ended, and the two classes of firms who, most readily, found places for their men were the textile machinery manufacturers and automobile firms, the lighter side of the latter industry having been in a good position for some time past. It is thought, however, that very few of the makers of the more expensive cars are likely to show profits. While exports may not be up to the mark, home orders for the cheaper cars are not lacking and in some instances double shifts are reported. With the trade in cycles, both ordinary and motor, appearing to be satisfactory.

As regards commercial vehicles, the decision not to hold the annual exhibition in the autumn of this year is not without significance. Aircraft and particularly the aero engine people complain of government neglect. One large firm is reported as considering the closing down of this part of its works in the near future as soon as certain foreign orders are executed, while another will probably build or arrange for building in France. Despite some orders reported, the steam locomotive building industry is in no very satisfactory condition and this applies also to the agricultural machinery side.

As to Scottish shipbuilding, a recent statement of the output on the Clyde speaks for itself. For the first six months of the present year the production of launches aggregated 167,468 tons, a decrease of more than 68,000 tons as compared with the same period of last year. The record established during the first six months of 1913 amounted to nearly 350,000 tons. In short the engineering and shipbuilding trades must be regarded as fighting for their existence. Current complaints as to excessive railway rates charges for the transportation of food and other commodities are heard here with no less frequency than is the case elsewhere.

### Industries Show Losses

In many instances the effect of the recent lock-out has been to improve the relationship between employer and employee, and negotiations are starting with a view to reductions in, if not the complete elimination of, the war-time bonus. Even as it is, in some districts the wage rates of skilled workmen are below those of street cleaners.

The decline in the cost of materials was indicated recently by the chairman of John Brown & Co., Ltd., steel makers, Sheffield, when he stated that English basic pig last year was being offered at £9 a ton as compared with Belgian pig in this country at £5 a ton, whereas English pig is now down to £4 10s. Similarly, while last year basic blooms were priced at £15 English and £8-15s. Belgian, today the English price is £8-10s. Again, last year steam coal was 35s. a ton at the pit while now it is below 20s. Parenthetically we may remark that, whereas some coal distributors in the London area had been asserting their profit per ton to be no more than 5d., yet a week or two ago they managed suddenly to cut prices by 9s. a ton without, however, stimulating the hoped-for demand.

Returning to the Sheffield concern, it was pointed out that in their works the output was not more than one-third that of the previous year and, while the shops had been reconstructed to meet peace developments, the trade had not materialized. It is also pointed out that the stoppage of Admiralty orders, following the Washington conference, undoubtedly had a detrimental effect on Sheffield. For this the worst year in the history of the company as far as the chairman could remember, a dividend of 5 per cent has been paid, and little hope is held out for increased disbursements next year. Ruston and Hornsby, Ltd., builders of internal combustion engines, etc., had to transfer £100,000 from the general reserve to meet further diminution in the value of stock in trade, and W. Foster and Co., Ltd., agricultural engineers, Lincoln, reported a loss of £7,500. Vickers, Ltd., announce a dividend of 5 per cent on ordinary shares, but this, in itself, indicates an improvement as these

(Continued on page 168a)

# The Business Barometer

## This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

By THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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The substratum of confidence and optimism which underlies American business at present is indicated by the imperturbability with which the markets received the rather unsatisfactory strike news published last week. A great many trains have been annulled because of the railway strike and at this writing it is uncertain whether President Harding's efforts to get the coal mines reopened will succeed.

The steel industry is slowing down in some localities for want of fuel. A shortage of building material is commencing to be felt because the brick kilns and tile factories are without coal and the railroads cannot move lumber and cement as rapidly as they are required.

### Higher Coal Prices

The feeling is that the force of public opinion plus the moral suasion of the Government will induce the strikers to resume work under some sort of *modus vivendi*. This feeling is probably warranted, but it is likely nevertheless that it will be a winter of very high priced coal, for the surplus supply of bituminous has been used up and the most hopeful estimates of non-union production do not exceed six million tons a week as against a normal consumption of nearly twice that quantity.

In so far as anthracite is concerned the outlook is even graver, for the mines are tightly unionized and there is but little likelihood that they will be soon reopened. Two hundred thousand tons of English coal is on the way here, but this is but a drop in the bucket.

The plight of the railroads is less serious. There is reason to hope that most of their employees will soon return to work, but the accumulated arrears of traffic and the quantity of coal that must be hurriedly moved when mining is resumed will probably overtax many lines. The wisdom of prompt shipment when shipment can be made is therefore increasingly self evident.

But we need not emphasize the gravity of the labor troubles. They are generally understood and appreciated, and we shall no doubt muddle through them somehow. The domestic situation is otherwise almost flawless and most omens are auspicious. The Federal Reserve Bank statement shows a further gain of $10,000,000 in the gold supply and a reserve ratio of 77.8 per cent as against 77.3 at the end of the preceding week. Commercial paper is selling readily at 4 per cent and easy money seems assured for a long time ahead.

Most American bonds, including Libertys, are firm and slightly higher, but the demand for foreign obligations has not recovered from the shock given it by the threat of Germany to confess bankruptcy.

European conditions are, however, improving. It is generally understood that Great Britain has offered to forgive the debt that France owes her if the French will agree that the reparations demanded of Germany shall be reduced from 132 billion to 50 billion gold marks. If the French are sensible enough to accept this proposal, which is as generous as it is wise, the way will be opened for an international loan to Germany which will greatly accelerate reconstruction throughout Europe.

Meantime it is probable that the reparation commission will accord Germany a two years moratorium during which she will have opportunity to catch her economic breath. As bearing upon the value of the mark it should be noted that at the present quotation of 20 cents a hundred the 172 billion paper marks outstanding are worth only 344 million dollars, and that the Reichsbank holds about one billion gold marks having a value of about 240 million dollars.

In the light of these figures a purchase of marks at present prices would seem to be a promising speculation at very long odds for those who are able and willing to undertake the rehabilitation of Germany's credit.

In the New York and London stock markets the tone has been almost firm. American railway shares have been conspicuous for their strength and the indications favor a sharp advance when the earnings reflect the large autumn traffic in prospect. Crop reports are good and merchants from the agricultural sections are buying more confidently in the wholesale markets.

The number of buyers registered in New York last week was the largest on record for this season of the year and trade in the dry goods district was noticeably active. The shortage of cotton goods resulting from the New England textile strike is now commencing to be felt. The American Woolen Company surprised the trade in the reductions made at its "spring opening" last Monday. The buying is said to have been general but not quite as large as it might have been if the tariff bill were not still in the air.

### Staples Show Recovery

The American market for raw wool is reactionary, but at the Colonial Wool Sales held in London some advances were recorded. Here again the tariff is a factor whose influence upsets commercial calculations.

The candid minded admit an improvement in the cotton crop, but prices have changed but little as experienced traders realize that unfavorable weather in August might cause great damage.

Raw silk is rising again. Burlap and jute are also higher upon advices from India emphasizing the shortage in the jute crop.

Coffee has been quiet and easier. The fear that the Brazilian Government is selling or may sell its holdings continues to haunt the trade despite denials.

Sugar has advanced as I expected and the market is developing sensational strength. The surplus supply of last January has been all distributed. A sharp reduction in the American acreage planted to beet sugar is reported by the Agricultural Department and some statisticians now figure that the supply left available for this country will be less than the consumption. A minus stock of sugar or anything else is of course impossible, but there is every indication of a further and substantial advance before the indicated disproportion between supply and demand is readjusted.

### Conditions Approaching Normalcy

Rubber, which is about the only commodity that is still subnormally low, continues to drag. The trade awaits definite news that the production will be restricted, but consumption is commencing to make some impression on the surplus stocks and it is quite possible that as in sugar we may wake up some morning to find that they have vanished.

When basic commodities are well below the cost of production they generally disappear with surprising rapidity. This statement is also partially applicable to copper, for although at the current quotation of 14 cents it is not below the cost of production, that price seems to be sufficiently low to induce a large offtake.

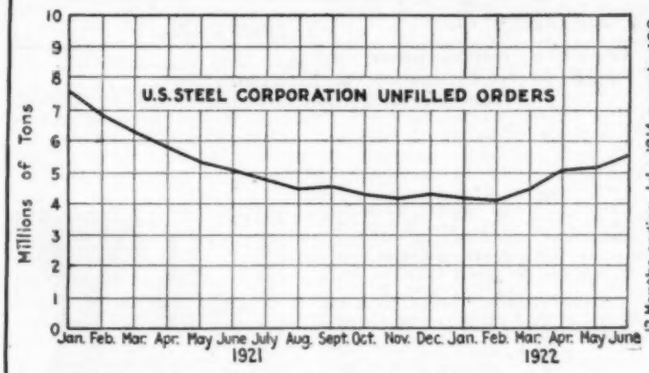
The June report of foreign trade shows merchandise exports worth 334 million dollars and imports valued at 260 millions. For the fiscal year ending June 30, 1922, the excess of exports was 1163 millions as against 2838 millions for the previous twelve months.

These figures indicate a return to normalcy in so far as our trade balance is concerned and as a generalization the other news of the week is to be similarly construed.

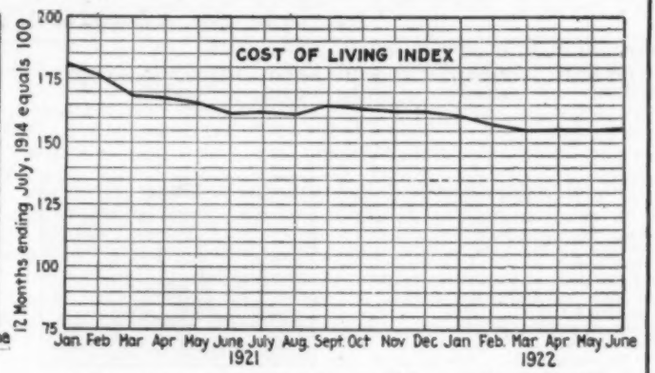
All things considered the world's business, especially in America, is recovering from the disorganization of the war with amazing rapidity, but perfection is impossible and in even the brightest skies some clouds will from time to time be seen. On the whole, the machine of civilization is running with remarkable smoothness.

## Southern Exports Show Big Improvement

Indications of rapid improvement in the export business from the various southeastern ports of the United States during the past two or three months are shown in the June report for the port of Savannah. The figures available show that exports of cotton, lumber and naval stores from the port for the month were greater than in any month in more than a year. The month of July has started with unusual activity, indicating a still better record as compared with June.


U.S. STEEL CORPORATION UNFILLED ORDERS
Millions of Tons
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June
1921
1922

**Unfilled orders of U. S. Steel Corporation based on the monthly reports showing the forward tonnage on the books at the end of each month.**


COST OF LIVING INDEX
12 Months ending July, 1914 equals 100
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June
1921
1922

**Index of the Cost of Living based on weighted retail prices collected monthly and compiled by the National Industrial Conference Board.**

DESPITE the coal and railway strikes, unmistakable signs of good, sound business prosperity are to be found on every hand. To some extent these disturbing factors temporarily may effect production and retard industrial improvement, but with the country on the eve of a big industrial revival, and with the working man sorely in need of steady employment, confidence is expressed in well-informed circles that a speedy and satisfactory solution of the troubles will be found.

**Unfilled tonnage of the** U. S. Steel Corporation on June 30 reached the high point of 5,635,531 tons. June production of pig iron shows an increase of 45,651 tons over May, reaching the highest point recorded since January 1921.

**Early forecasts of crop** yields are favorable with an indicated production of wheat, oats, barley and rye on a par with that of last year. Cotton consumed totaled 509,869 bales, with 491,097 bales exported. Stocks of cotton on hand continue to decline with 3,268,000 bales being shown as of June 30 as compared with the January 1 stock of 6,915,000 bales.

**Loadings of revenue freight for the** week ending July 8 totaled 718,319 cars, a reduction of 158,577 cars as compared with the week previous, but an increase of 77,784 cars over the corresponding week of 1921. Idle cars on July 1st because of business conditions totaled 405,185 or a reduction of 23,889 from the previous week. Of this total 239,225 cars were of the freight class in good repair in excess of current freight requirements while the remaining 165,960 cars were freight cars in bad order in excess of the normal number unfit for service. Of the total 2,266,045 cars on American railways, reports indicate 324,583, or 14.3 per cent to be in need of repairs, as compared with 14.6 per cent on June 15 or a reduction of 8,089.

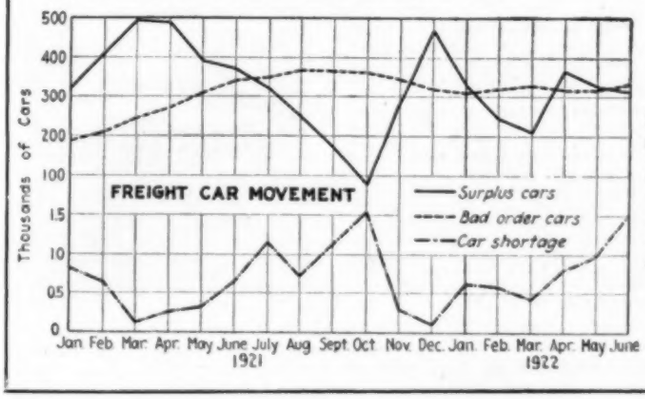
## Comparative Prices of Shop Supplies

Average of New York, Chicago and Cleveland Prices

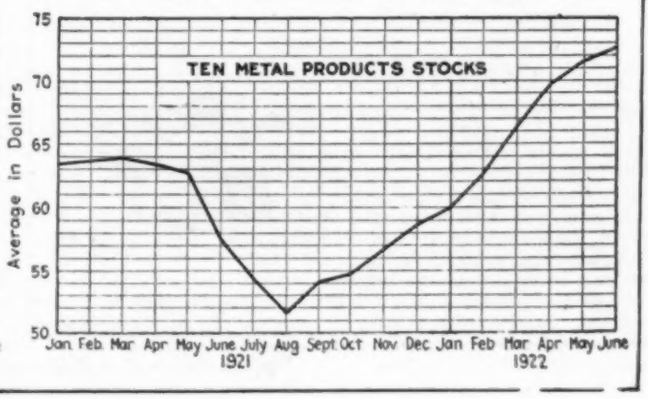
| | Unit | Current Price | Four Weeks Ago | One Year Ago |
|---|---|---|---|---|
| Soft steel bars | per lb. | $0.027 | $0.0252 | $0.301 |
| Cold finished shafting | per lb. | 0.0350 | 0.325 | 0.0435 |
| Brass rods | per lb. | 0.173 | 0.1550 | 0.161 |
| Solder (½ and ½) | per lb. | 0.23 | 0.213 | 0.203 |
| Cotton waste | per lb. | 0.11 | 0.11 | 0.122 |
| Washers, cast iron (⅛ in.) | per 100 lb. | 3.83 | 3.83 | 4.06 |
| Emery, disks, cloth, No. 1, 6 in. dia. | per 100 | 3.11 | 3.11 | ..... |
| Lard cutting oil | per gal. | 0.575 | 0.573 | ..... |
| Machine oil | per gal. | 0.36 | 0.40 | ..... |
| Belting, leather, medium | off list | 40–5% @50% | 40–5% @50% | |
| Machine bolts up to 1 x 30 in. | off list | 55% @60% | 50%@ 65–10% | 50%@ 60–10% |

**Foreign affairs** at the moment appear brighter than has been the case for some weeks past. Berlin has agreed to accept the guarantee committee's proposal of allied supervision of her finances. This gives encouragement. It indicates, in some measure, a settlement of the reparations question, and is a matter of prime importance to American industry. The American public is more keenly interested in conditions abroad today than ever before. Evidence of this fact is had in the foreign loans offered in the United States which continue to increase in volume. Between January 1, 1921, and June 26, 1922, foreign loans offered and absorbed in the United States totaled the huge sum of $1,369,006,125. Offerings in the first half of 1922 alone total $673,801,900, and the readiness with which they have been absorbed is noteworthy, reflecting as it does the state of the public mind toward the peoples and industries in other parts of the globe. It bespeaks the faith of American investors in the future of the nations abroad.

**Monthly average of car shortage, surplus and bad order cars in the United States based on returns to the car service division of the American Railway Association.**


FREIGHT CAR MOVEMENT
Surplus cars
Bad order cars
Car shortage
Thousands of Cars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June
1921
1922

**Monthly average: Ad. Rumely; Allis-Chalmers; American Can; Cont. Can; Gen. Elec.; Int. Harv.; Nat. Acme; Und. Type.; West. Elec. & Mfg. Co., Worth. Pump.**


TEN METAL PRODUCTS STOCKS
Average in Dollars
Jan. Feb. Mar. Apr. May June July Aug. Sept. Oct. Nov. Dec. Jan. Feb. Mar. Apr. May June
1921
1922

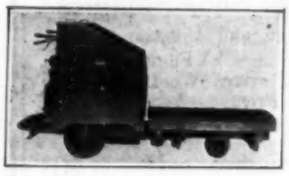
# Condensed-Clipping Index of Equipment

*Patented Aug. 20, 1918*

**Crib and Gage, Drill, Tap, "One-glance"**
Victor R. Lawson Co., 35 Hartford St., Boston, Mass.
"American Machinist," March 30, 1922

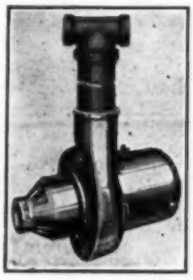
The device, consisting of a drill crib with a drill gage built into it, is 41 in. long by 9¾ in. wide, and contains sixty semicircular pockets 1¼ in. wide to hold drills from No. 1 to No. 60. The holes for the drill gages are located just at the ends of the pockets in hardened steel strips. Figures ¼ in. in height on the frame give the number and diameter of drill to fit each hole. Three taps of each size from 14-20 to 4-36 are held. Each set is adjacent to the correct drill to use in drilling the hole for it in order to tap a full thread. The drills for ¼ or ¾ depth thread are easily available.

**Truck, Platform, Elevating, Gasoline**
Clark Tructractor Co., Buchanan, Mich.
"American Machinist," April 6, 1922



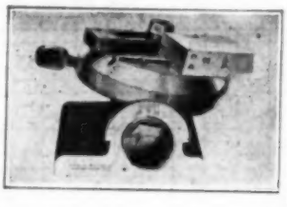
The truck platform will elevate a load of 4,000 lb. from a minimum height of 11 in. to a maximum height of 16 in. Automatic stops control both the upper and lower limits of travel, and the elevation can be stopped at any point. The lifting mechanism is operated by hydraulic pressure. Power for both locomotion and elevation is derived from a 15-hp., 4-cylinder tractor engine. Two speeds are provided in each direction. The driving and elevating controls and brake lever are mounted near the driver. The truck will climb a grade of 10 per cent with a 4,000 lb. load. Length, 107 in. Width, 35½ in. Height, 51 in. Platform, 26 x 45 inches.

**Blower, Furnace, Electric, Motor-Driven**
Clements Manufacturing Co., 601 Fulton St., Chicago, Ill.
"American Machinist," April 6, 1922



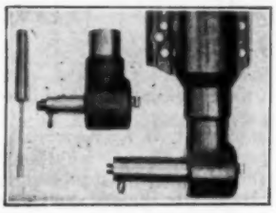
The blast is attached to small gas furnaces used in heat-treating, and consists primarily of a ¼-hp. universal motor propelling a small blower and operating on any specified voltage from 32 to 250. The blower is connected to the gas pipe, draws in air from the room, and delivers the mixture directly to the furnace. A damper is provided for regulating the mixture. The motor can be driven from the lighting circuit by attaching a plug to a convenient socket. The blast delivers 210 cu.ft. of air per minute when running at 10,000 r.p.m. Weight, 13 lb.

**Fixture, Grinding, Chamfer**
Geometric Tool Co., New Haven, Conn.
"American Machinist," April 6, 1922



The machine is used in grinding chamfers on the milled chasers made by the concern and in grinding tapped chasers. With the fixture, all chasers of a set are equally ground. Either left- or right-hand chasers may be handled. The fixture table is graduated and can be set for grinding either long or short chamfers. The side of the fixture is graduated for tilting the table to the angle of chamfer clearance. The fixture may be bolted to the table of the grinding machine or mounted on a machine slide.

**Attachment, Drilling, Offset**
H. E. Harris Engineering Co., Bridgeport, Conn.
"American Machinist," March 30, 1922

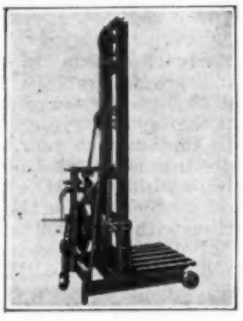


The attachment is used for work where a very small clearance space is available, and is intended especially for drilling, milling, countersinking and counterboring. It is made to reach into the main bore of a cylinder and drill or mill the vents or ports from the inside. The offset or horizontal arm is made as large as the bore of the air chamber and the depth of drilling or milling will permit. Drills, mills and counterbores having special shanks ground and lapped to fit the spindle in the outer end of the arm, are used.

**Crane, Industrial, Locomotive-type, Three-Movement**
Baker R. & L. Co., 2180 West 25th St., Cleveland, O.
"American Machinist," April 6, 1922

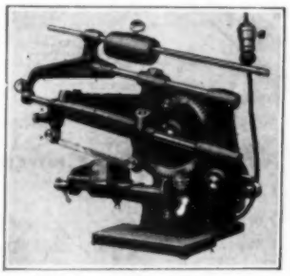
The crane, used in both lifting and carrying work, has a capacity for lifting 2,000 lb. at a radius of 4 ft. from the pivot of the crane, and 1,600 lb. at a radius of 8 ft. All controls are located on the dash in front of the platform. The machine is driven by a motor running at 1,150 r.p.m. and provided with three speeds in each direction. The lifting mechanism consists of a Sprague electric 1-ton hoist, and the boom may be raised by means of a similar hoist. A fourth motor with an electric brake swings the crane. Weight 6,600 lb.

**Stacker, Lifting and Conveying**
Lewis-Shepard Co., 560 E. First St., Boston, Mass.
"American Machinist," April 6, 1922



The machine is used for lifting, transporting and tiering materials in a shop or warehouse, and is mounted on three roller-bearing wheels. The front wheel can be lifted, so as to rest the two legs on the floor. The platform can be supplied with either roller or plain top, and has a minimum height of 10 or 8 in., respectively. It travels vertically on two 5-in., hinged channels, and is lowered by a lever. The height of the hinge as well as the length of the channels, can be furnished to suit the work. The machine may be operated either by hand or by electric power, and on all except the smallest size two speeds are provided. Platform, 36 x 24 in. Base, 39 x 50 inches.

**Sawing Machine, Hack, Bench, Power-Driven, Portable**
Edlund Machinery Co., Inc., Cortland, N. Y.
"American Machinist," April 6, 1922



The machine, used for fast cutting on small jobs ordinarily performed by hand, or on work usually performed by larger machines, can cut tool steel as well as softer metals. Power is supplied by a small electric motor. The saw arm has two rods on which the saw frame slides, and cutting is performed on the backward stroke. The pressure of the feed can be varied to suit the work by changing the position of the weight on the arm. The machine stops automatically when the cut is finished. A screw-operated vise holds the work.

*Clip, paste on 3 x 5-in. cards and file as desired*

## Business Conditions in England

(Continued from page 165)

shares have received nothing since the dividend paid for 1919. The holdings in shares of this class amount to between 12 and 13 millions of pounds.

The electrical engineering concerns seem to be showing some decline. Cromption and Co., Chelmsford, has announced a decrease in net profits of £30,463. The ordinary dividend paid was 5 per cent instead of 10 per cent, while nothing was placed to the general reserve. On the other hand £10,000 has been set aside "to meet possible future taxation." This firm forms one of the concerns in which the Armstrong-Whitworth group are interested. It has been joined by C. Walmsley and Co., Ltd., Bury, manufacturer of paper-making machinery, working in conjunction with the Armstrong-Whitworth hydro-electric department, which seems to be particularly busy in connection with wood pulp. For the manufacture of newsprint the Walmsley firm recently introduced machines 232 in. wide, claimed to be the largest in the world. The first machine of this type has recently been set up in Canada.

Combinations of this kind have been reported as passing through difficult times, and the B. S. A. recently announced a loss for the year of £355,424, increased to £469,168 by interest on certain loans issued in 1920. The ordinary shares received no dividend. The company's contingent liability under guarantee in certain aircraft concerns has been reduced by about £400,000 and stands at something more than £550,000 The directors are under the impression that no charge is ultimately likely to fall on the company.

More orders are once again being placed with electrical engineering firms, largely in connection with the extension and improvement of the London tube and other railways. The combination known as the English Electric Co., has also received orders for electric locomotives for Japan amounting to half a million pounds and will electrify a section of a French railway and of a New Zealand railway also.

Meanwhile the cost of living, as officially calculated, has fallen to 80 per cent above that of 1913 but shows a tendency to rise. Money is cheaper, and the bank rate, without waiting for New York, has been reduced to 3½ per cent with a further reduction confidently anticipated. The usual assurance that this means the encouragement of industry has been given and, in fact, many fresh issues of capital are anticipated. Then again, the number of people who "whistle for the wind" by asserting that we have reached the bottom and are on the up grade, has very sensibly diminished. If we had "turned the corner" as often as was reported we should by now be a very giddy race.

In his address before the National Machine Tool Builders Association, according to report, Mr. A. H. Tuechter asserted that "in England, the Machine Tool Builders Association has arrived at a standard for milling machine spindles so that in the future, every milling machine built in England will be able to use the same face mills, arbors, etc., that are used on every other make of English milling machine. It is understood that the English standard is based on some American practice." There is perhaps some confusion of facts here, for the Machine Tool Trades Association (we have no Tool Builders Association) has done nothing in this matter. Some time ago, two rival sets of manufacturers here, namely Alfred Herbert, Ltd., and the constituent firms concerned in the Associated British Machine Tool Makers, Ltd., standardized their own practices as to spindle noses, which, however, differ. The whole matter was fully discussed in the columns of the European edition of this journal nearly three years ago, and it appeared that while the A. B. M. T. M. standard was that of the Cincinnati Milling Machine Co., the Herbert standard, on the other hand, had been adopted by Brown & Sharpe.

## Swiss Automobile Industry Facing Crisis

According to a report just received from our correspondent in Switzerland, the automobile manufacturing industry of that country is facing a grave situation. All laws passed by the federal authorities imposing restrictions and prohibitions on foreign imports to aid the industry have come too late. They became effective only after the record year of 1920 showing an importation of foreign automobiles aggregating 75 million francs in value.

The official figures for the first quarter of the present year speak for themselves. While during the first quarter of 1921 the exports still reached a value of 2,020,000 francs, they amounted during the first quarter of 1922 to only 403,000 francs, a decrease of 1,617,000 francs in a period of three months. This is the worst figure recorded since Swiss automobile statistics have been published. How small and trivial the home demand has become for the Swiss automobile industry is best evidenced by the breakdown of a number of the leading factories of the country. Had the federal government not opened a great number of new automobile-postal-routes, and thus placed considerable orders with the home factories, the situation would be still more discouraging.

Imports also show large decreases. During the first quarter of 1921, automobiles brought into the country had a total value of 15,200,000 francs. During the first three months of the current year the imports were valued at but 5,200,000 francs, a decrease of 10,000,000 francs, and indicating the general crisis through which the country is passing.

The few exports which have been made have gone, chiefly, to France, England and Spain. Only one country, namely, Roumania, bought over 100,000 francs worth of Swiss automobiles. Up to the year 1921, Spain and the Dutch East Indies offered a good field for the Swiss automobile industry, but it seems that the Spanish market is definitely closed to the industry since Spain has raised her import duties to such an extent as to make them now absolutely prohibititve.

The principal countries from which automobiles were imported during the first quarter of 1922 were, in order of importance: France, 1,442,000 francs; Italy, 1,216,000 francs; Germany, 1,175,000 francs; Austria, 455,000 francs; United States, 392,000 francs; Great Britain, 278,000 francs; Belgium, 221,000 francs.

The United States in 1921 held the fourth rank in the Swiss importation but is now surpassed by Austria. Four-fifths of the cars imported were "leather covered," as the statistics say, and, therefore, exclusively new passenger cars. The reason why the German import figures are relatively small lies in the fact that German manufacturers impose a heavy extra charge on automobiles for export trade, and many orders, therefore, go to Italy and France. If Germany were to sell to home and foreign buyers at the same prices, she would no doubt control the Swiss automobile market, just as she does the bicycle trade at the present time, more than two-thirds of which come from that country.

## Business Items

The Bastian Blessing Co., Chicago, Ill., manufacturers of welding and cutting apparatus, has announced that it has taken over the entire output of the line of soldering equipment, trucks, preheaters and acetylene generators produced by the St. Paul Welding and Manufacturing Co. The latter company will act as service distributors throughout the Northwest, maintaining and operating a service station at St. Paul.

The Hayes-Meserole Manufacturing Co., Inc., Milford, Conn., recently incorporated under the laws of Connecticut, with a capital stock of $100,000 to manufacture wire, wire products, etc., has taken a lease on a portion of the former plant of the United States Rubber Co., Milford, and is making arrangements to start production shortly.

The Milford Electrolytic Iron Co., Milford, Conn., recently organized, announces it has secured a lease on the factory plant of Page and Nettleton on New Haven Ave., and is having extensive alterations made to the building. The company expects to start production in the early fall.

The Hartford Foundry and Machine Co., Hartford City, Ind., has increased its capital stock to $75,000.

The J. G. Dickson Co., Pittsburgh, Pa., has recently moved its plant to 317 South Main Street, West End, in order to secure larger quarters to take care of proposed expansion.

The Mesta Machine Co., Pittsburgh, Pa., announces the removal of its Chicago office from the McCormick Building to the Peoples Gas Building, with A. B. Neuman in charge.

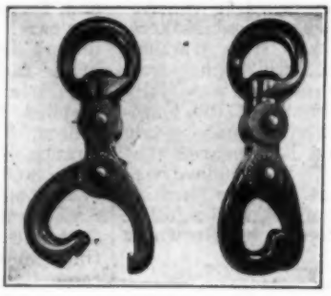
The Taft-Pierce Manufacturing Co., Woonsocket, R. I., manufacturers of special machinery, recently increased its capital stock from $300,000 to $1,200,000.

The Guy Steel Casting Co., West Hartford, Conn., recently incorporated to engage in the metal castings and steel treating business, with a capital of $50,000, was organized during the past week by the election of the following officers: president, John A. Guy, Hartford; vice-president, John E. Synott, Hartford; treasurer, William R. Bennett, Hartford; and secretary, George B. Kinghorn, of Southington, Conn.

# Condensed-Clipping Index of Equipment

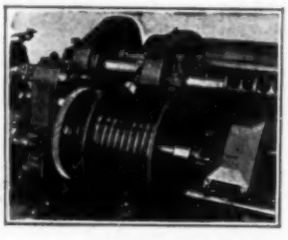
*Patented Aug. 20, 1918*

**Hook, Crane, Safety, "Yankee"**
Frank W. Trabold, 30 Church St., New York, N. Y.
"American Machinist," April 6, 1922



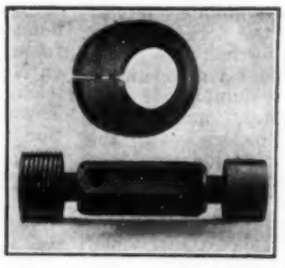
The hook is used on hoists and cranes when lifting loads. The load hangs directly on a curved member pivoted on the other longer member shown at the left side. The entire load must be off the hook in order to open it. When the weight carried becomes excessive, then the straight member shares in the load. The hook can fail only when the load exceeds the ultimate strength, and not when it exceeds the elastic limit. The swiveling member may be omitted. The hoist is ordinarily made in sizes having capacities of 1, 3, 5, 15 and 25 tons.

**Cable Retriever, Feeder**
Pawling & Harnischfeger Co., Milwaukee, Wis.
"American Machinist," April 6, 1922



The device is used for winding a cable which supplies current to a lifting magnet carried by a crane. The large, flanged drum is driven by the motor that hoists the magnet. The retriever keeps the cable taut at all times, so that no slack is allowed; but this tension is adjustable. Although the drive is through gears, the final drive is through friction members. The drum is driven only while the magnet is being hoisted. When the magnet is lowered, its weight unwinds the cable against the retarding force of the friction mechanism.

**Gages, Thread, Ring and Plug**
Superior Thread Gauge Manufacturing Co., Brooklyn, N. Y.
"American Machinist," April 6, 1922

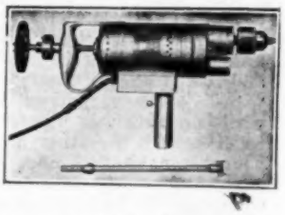


The principal feature of the ring gage is that the hole is eccentric to the outside diameter, so that sufficient spring is obtained at the small section of the gage in adjusting the size. Only one cut breaks the continuity of the thread. By placing the hole eccentrically, a smaller outside diameter is possible than with the concentric style. The size of the ring is adjusted by tightening the set screws. In the plug gage the ends can be removed from the handle. The gages are made in U.S.S. and S.A.E. sizes for diameters from ¼ to 2 in. They can also be furnished in larger sizes to suit special work.

**Boring Machine, Two-Way, Motor-driven, Semi-automatic**
Manufacturers' Consulting Engineers, McCarthy Bldg., Syracuse, N. Y.
"American Machinist," April 13, 1922

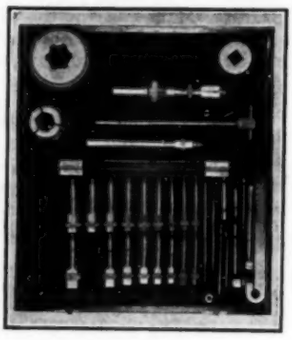
The machine is used for boring simultaneously both sides of the work, as when boring, bottoming and reaming both the exhaust and the intake ports of gas engine cylinders. The workholder accommodates four cylinders, and can be rotated about its central axis. The multiple heads at the two ends of the machine are fed toward the center simultaneously, where they finish the work and then return to their outer positions. The workholder is then indexed to the next position, and the feed for the heads engaged by a hand lever so that the cycle is repeated.

**Drill, Electric, Portable, with Grinding Attachment**
Louisville Electric Manufacturing Co., Louisville, Ky.
"American Machinist," April 6, 1922



The grinding attachment is placed on a Pioneer "garage special" drill to adapt the tool to such work as sharpening toolbits. The drill has the usual drilling spindle, as well as a device for oscillating the automotive valve grinding tool. The tool for driving the valve is shown below the drill. The grinding attachment fits in the rear of the armature shaft and passes through the handle; it can be quickly removed. The bearing that fits in the handle is equipped with ball bearings for the spindle, the speed of which is normally 9,000 r.p.m. The tool is furnished to operate on either alternating or direct current of either 110 or 220 volts.

**Broach, Adjustable**
Edward Hollander Tool Co., 142 Miller St., Newark, N. J.
"American Machinist," April 6, 1922

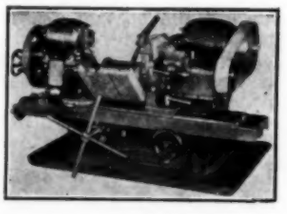


The tool is used primarily in a shaper, but can be used in a drilling machine, lathe or screw machine. Type B consists of a shank on one end of which are the cutting edges, this end being slit in the center of each flat face, so that it can be expanded. Type A broach consists of a holder held in a suitable shank, with a mechanism for expanding the cutter. The tools ordinarily cut to a depth of 2½ in., but with the extension attachment provided they cut to a 5-in. depth. The cutters are sharpened by merely grinding the front face. They can be furnished either individually or in sets to suit any requirements.

**Gage, Amplifying,**
American Gauge Co., Dayton, Ohio.
"American Machinist," April 6, 1922

The tool is similar to the larger gage made by the concern, although it is more limited in its range and does not have all of the attachments. It is used in grinding and inspection departments, and can be furnished in two sizes, one for measuring round work from ¼ to 2 in. in diameter and the other for work from 2 to 4 in. in diameter. The anvil block can be removed or its position adjusted, as can also the stop for the work. The height and position of the measuring point are adjustable by moving the entire arm. Clamping levers lock the adjustments in place.

**Grinding Machine, Wet, Bench, "Re-li-o," No. 2**
Van Norman Machine Tool Co., Springfield, Mass.
"American Machinist," April 13, 1922



The machine has been adapted to wet grinding and is suitable for the use of cylinder regrinding shops and piston distributors. The wheelhead is equipped with a ½-hp. motor carrying an 8 x ¾-in. abrasive wheel. The wheelslide is longer than in the dry type, and some parts of the machine are heavier. The removable toolholder mounted on the front of the wheelslide can be swung into and out of the operating position without changing the position of the set-up or dismounting the grinding wheel. The wheel is not rotated while the lathe tool is cutting. An adjustable stop is provided for the table. Weight, 600 pounds.

*Clip, paste on 3 x 5-in. cards and file as desired*

# Personals

JOHN A. CAMM, for several years past connected with the Kearney & Trecker Corporation, has resigned his position with that company to become president of the Western Iron Stores Co., Milwaukee, dealers in machinists' supplies and tools.

GIFFORD K. SIMONDS, president of the Simonds Manufacturing Co., Fitchburg, Mass., has recently been elected president of the Waltham Watch Co., Waltham, Mass.

A. G. CROCKER has been appointed manager of the power division of the Detroit office, Westinghouse Electric and Manufacturing Co.

W. W. SPANGLER has been appointed assistant manager of syndicate operations, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

H. F. BOE has been appointed manager of the industrial division of the Buffalo office, Westinghouse Electric and Manufacturing Co.

W. C. KOEHLER has been appointed manager of the cost and development section, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

M. H. SCOTT has been appointed chief clerk of the supply department, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

C. J. MESTA, second vice-president of the Mesta Machine Co., Pittsburgh, Pa., and located in the company's Chicago office for more than a year, has returned to the home office to take charge of the sales department of the company.

T. A. MCDOWELL has been appointed executive assistant to the manager of the recently organized suply department, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa.

L. C. BULLINGTON, for several years past, assistant to the manager of the power department, Westinghouse Electric and Manufacturing Co., Pittsburgh, Pa., has been made assistant manager and will have charge of the general work of the power department.

# Obituary

John M. Goodwin, general manager of the New Process Twist Drill Co., drill manufacturers, Taunton, Mass., died at his home in that city July 4.

Nathan Esterbrook, New Haven, Conn., formerly head of the Esterbrook Manufacturing Co., died in that city, Tuesday, July 18, at the age of eighty-six years. Mr. Esterbrook served in the Civil War as an officer, and has been prominent in business circles and civic affairs in New Haven for the past fifty years.

# Book Reviews

**Metric System for Engineers.** By Charles B. Clapham, Hons. B.Sc. Cloth; One hundred seventy-eight 6 x 9-in. pages. Published by E. P. Dutton & Co., New York, N. Y. Prive $6.

The book furnishes a practical explanation of the metric system to meet the requirements of engineers, draftsmen, mechanics and others who deal with calculation and measurement in detail. The usual tools for measuring length, area, volume, capacity and mass, that may be graduated in metric units, are explained, and diagrams of verniers, micrometers and planimeters are given to illustrate their use. Calculations in connection with screw cutting and gear wheels are also dealt with at some length, and four pages are devoted to gear tables.

The commoner compound measures met with in engineering are taken up in Chap. VI. Moment, energy and work, velocity, acceleration, power, loads on beams, pressure, stress, density, specific volume, impurities in liquids, radius of gyration, moments of inertia, train resistance, weight of prime movers, fuel consumption of engines, temperature, heat quantities, calorific value of fuel, heat radiation and the C. G. S. system are discussed, and examples of the conversion of the formulas into metric units are given.

Chap. VII includes tables of the commoner engineering constants in both British and metric units. Chap. VIII contains examples of the alteration of numerical constants in engineering formulas.

A brief survey of the arguments advanced for and against the metric system is made in Chap. IX. The history of the system and the practicability of its adoption are told. The author treats the subject from what he considers an impartial attitude. He states: "The foregoing brief survey of the controversy on the metric system is not in any way intended as propaganda on either side. The real object of the book is *explanation* of the system, but it was thought that an attempt at a more impartial treatment of some of the points than is usually met with would be of interest."

Although in favor of the universal adoption of the system, the author admits, however, that it would be a difficult matter to change the English screw thread standards: "Furthermore, the standardization of screw threads has been carried to such lengths, and screw threads are so widely met with in all branches of engineering, that no alteration of the existing standards can be considered. Hence it appears that the present screw-thread standards would have to be retained with dimensions which, in millimetres, would be odd. This would necessitate retaining inch-pitch leading-screws on lathes to avoid complications in screw cutting."

Thirty-four tables are grouped together for easy reference in the last section, and include both exact and practical equivalents and conversion tables. An envelope on the back cover of the book holds the three detached conversion charts for office use in converting the commoner compound measures.

# Trade Catalogs

**Testing Machines.** The Pittsburg Instrument and Machine Co., 40 Water Street, Pittsburg, Pa. A bulletin describing the various styles of Brinell testing machines for determining the hardness of materials. Surveying instruments and impact testing machines are also described.

**Rust Preventors.** Oil Specialties and Supply Co., 39 Cortlandt St., New York City. A bulletin on the subject of the cause and prevention of rust with information describing Rustavoid, a preservative coating material, made by this company.

**Pneumatic Tools.** The Chicago Pneumatic Tool Co., 6 East 44th Street, New York City. Special publications Nos. 686 and 687, issued in the form of broadsides illustrating, with numerous photographs, the application of pneumatic tools to many phases of engineering, manufacturing and construction work. Numerous novel methods of using air tools are featured, interesting and of value to engineer and contractor.

**Architects' Specification Hand Book.** The Truscon Laboratories, Detroit, Mich. A handbook of 108 pages, size 8½ x 11, in loose leaf form, with a complete index. This handbook has been prepared and published by the Truscon Laboratories for the purpose of furnishing to architects and engineers such information as they require in preparing specifications for waterproofing, damp proofing, oil proofing, floor hardening, and other protective finishes. Each set of specifications is accompanied by a description of the particular product, arranged logically on the reverse side of the sheet and a list of prominent users of each product is set forth. The handbook is noteworthy for the care shown in its arrangement; the clear concise manner in which each specification has been prepared, and should prove of considerable value to engineers and architects.

**Ball Bearings.** The New Departure Manufacturing Co., Bristol, Conn. A folder featuring the application of New Departure bearings to the record breaking cars in the Memorial Day race at Indianapolis.

**Metal Cutting Saws.** Henry Disston and Sons, Inc., Philadelphia, Pa. A catalog of thirty-six pages describing the Disston line of metal cutting saws of all styles, files, hack saws and swages.

**Piston-Ring Groove Cleaner.** The Vedoe-Peterson Co., Norfolk Downs, Mass. A leaflet describing the V-P Groove Cleaner for cleaning carbon from piston ring grooves.

**Expansion Reamers.** The Vedoe-Peterson Co., Norfolk Downs, Mass. A leaflet describing the Nu-Angle expansion reamers made by the company.

**Metal Spraying Processes.** The Metal Coating Co. of America, 495 North Third Street, Philadelphia, Pa. An eighteen page pamphlet describing the Schoop Metal Coating process and apparatus for simultaneously melting and atomizing zinc, lead, aluminum, tin, copper, bronze, brass, nickel or monel, either in wire or dust form, and impacting them on any surface. The pamphlet contains a detailed description of the process and the apparatus with numerous cuts and line drawings, showing its application.

**Grindstones.** The Cleveland Stone Co., Cleveland, Ohio. A sixteen-page booklet containing a talk on the art of grinding with information on strelith and sterbon wheels made by the company.

**Flexible Couplings.** Smith & Serrill, general sales agents, Halsey Street and Central Ave., Newark, N. J. Bulletin No. 36 describing the construction details of Franckle flexible couplings as well as the Fintite rigid coupling.

**Welding and Cutting Machinery.** The General Welding and Equipment Co., 74 Brookline Ave., Boston, Mass. A catalog on modern welding and cutting. The various types of welding and cutting machines are described and illustrated together with examples of their application to certain work.

# Pamphlets Received

**Doing Business under Japanese Company Laws.** Trade information bulletin No. 46, by Frank R. Rutter, American Trade Commissioner, published by the Department of Commerce.

**Leather Belting Specifications.** A pamphlet of twelve pages known as Standard Specification No. 37, containing the specifications for leather belting officially adopted by the Federal Specifications Board for use of the various department and independent establishments of the Government in the purchase of leather belting. The pamplet has been prepared by the Bureau of Standards, Department of Commerce, Washington, D. C.

# Forthcoming Meetings

**Association of Iron and Steel Electrical Engineers.** Annual convention, Sept. 11 to 15 at the new auditorium, Cleveland, Ohio. Secretary, John F. Kelly, Empire Building, Pittsburgh, Pa.

**American Institute of Mining and Metallurgical Engineers,** annual convention, Sept. 25 to 28, 1922, San Francisco, Cal. Secretary, F. F. Sharpless, 29 West 39th Street, New York City.

**American Society for Steel Treating.** Exposition and convention at the General Motors Co. building, Detroit, Oct. 2 to 7. W. H. Eisenman, 4600 Prospect Ave., Cleveland, is secretary.

**American Manufacturers Export Association** annual convention, New York City, Oct. 25 and 26. Secretary, M. B. Dean, 160 Broadway, New York City.

**National Machine Tool Builders' Association.** Annual convention, New York City, October, 1922. Secretary, E. F. Du Brul, 817 Provident Bank Building, Cincinnati, Ohio.

**National Founders Association,** Nov. 22 and 23. Secretary, J. M. Taylor, 29 South La Salle St., Chicago, Ill.

# The Weekly Price Guide

## RISE AND FALL OF MARKET

**Advances**—Steel shapes, plates, bars, bands, hoops and blue annealed sheets, up 12c.; cold rolled strip steel, 15c. and slight advance in coppered bessemer rods in New York warehouses. Steel shapes and bars up 15c. per 100 lb. in Cleveland. Steel mill prices showing upward tendencies, due to coal and coke shortage. Shapes, plates and bars quoted at $1.70@$1.80, Pittsburgh, on current business. Some sales, however, and still going through at $1.60 on special tonnages but a maximum of $1.85 has been reached on shapes and bars and $1.90 per 100 lb. on plates, for immediate deliveries.

Tin quoted at 32¼c. as against 31¼c. and zinc at 6 7/16c. as compared with 6¼c. per lb. in New York, one week ago. Copper market slightly firmer. Fabricated copper and brass up ¼c. per lb. in Cleveland. Zinc sheets advanced ¼c. and solder 2c. per lb. in New York. Linseed oil quoted at $1.01, as against 98c. per gal. (5 bbl. lots) in Chicago.

**Declines**—Dealers' purchasing prices of old metals down ¼c. per lb. in Cleveland. Recent crude oil cuts causing downward tendency in lubricating oil prices; linseed oil also tending downward in several important centers. Lead market weaker.

## IRON AND STEEL

**PIG IRON** — Per gross ton — Quotations compiled by The Matthew Addy Co.:

| | |
|---|---|
| CINCINNATI | |
| No. 2 Southern | $25.50 |
| Northern Basic | 26.52 |
| Southern Ohio No. 2 | 26.52 |
| NEW YORK—Tidewater Delivery | |
| Southern No. 2 (silicon 2.25@2.75) | 31.66 |
| BIRMINGHAM | |
| No. 2 Foundry | 20.50 |
| PHILADELPHIA | |
| Eastern Pa., No. 2x (silicon 2.25@2.75) | 28.32 |
| Virginia No. 2 | 29.74 |
| Basic | 26.00 |
| Grey Forge | 26.00 |
| CHICAGO | |
| No. 2 Foundry local | 24.50 |
| No. 2 Foundry, Southern (silicon 2.25@2.75) | 27.17 |
| PITTSBURGH, including freight charge from Valley | |
| No. 2 Foundry | 25.50 |
| Basic | 25.50 |
| Bessemer | 25.50 |

**IRON MACHINERY CASTINGS**—In cents per pound:

| | Light | Medium | Heavy |
|---|---|---|---|
| Detroit | 10.0 | 8.0 | 3.0 |
| New York | 9@10 | 6.0 | 3.0 |
| Cleveland | 6.75 | 4.5 | 2.6 |
| Chicago | 5.0 | 4.5 | 3.5 |
| Cincinnati | 6.0 | 5.0 | 4.5 |

**SHEETS**—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

| Blue Annealed | Pittsburgh, Large Mill Lots | New York | Cleveland | Chicago |
|---|---|---|---|---|
| No. 10 | 2.40@2.60 | 3.75 | 3.25 | 3.63 |
| No. 12 | 2.45@2.65 | 3.80 | 3.30 | 3.68 |
| No. 14 | 2.50@2.70 | 3.85 | 3.35 | 3.73 |
| No. 16 | 2.70@2.90 | 3.95 | 3.45 | 3.83 |
| Black | | | | |
| Nos. 17 and 21. | 3.00@3.25 | 4.15 | 3.80 | 4.30 |
| Nos. 22 and 24. | 3.05@3.30 | 4.20 | 3.85 | 4.30 |
| Nos. 25 and 26. | 3.10@3.35 | 4.25 | 3.90 | 4.35 |
| No. 28 | 3.15@3.40 | 4.35 | 4.00 | 4.45 |
| Galvanized steel sheets: | | | | |
| Nos. 10 and 11. | 3.15@3.35 | 4.35 | 3.85 | 4.45 |
| Nos. 12 and 14. | 3.25@3.50 | 4.45 | 3.95 | 4.55 |
| Nos. 17 and 21. | 3.55@3.80 | 4.75 | 4.25 | 4.85 |
| Nos. 22 and 24. | 3.70@3.95 | 4.90 | 4.55 | 5.00 |
| No. 26 | 3.85@4.10 | 5.05 | 4.70 | 5.15 |
| No. 28 | 4.15@4.40 | 5.35 | 5.00 | 5.45 |

**WROUGHT PIPE**—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

| Steel | | | Iron | | |
|---|---|---|---|---|---|
| Inches | Black | Galv. | Inches | Black | Galv. |
| BUTT WELD | | | | | |
| 1 to 3 | 71 | 58½ | ⅜ to 1½ | 44½ | 29½ |
| LAP WELD | | | | | |
| 2 | 64 | 51½ | 2 | 39½ | 25½ |
| 2½ to 6 | 68 | 55½ | 2½ to 4 | 42½ | 29½ |
| 7 to 8 | 65 | 51½ | 4½ to 6 | 42½ | 29½ |
| 9 to 12 | 64 | 50½ | 7 to 12 | 40½ | 27½ |
| BUTT WELD, EXTRA STRONG, PLAIN ENDS | | | | | |
| 1 to 1½ | 69 | 57½ | ⅜ to 1½ | 44½ | 30½ |
| 2 to 3 | 70 | 58½ | | | |
| LAP WELD, EXTRA STRONG, PLAIN ENDS | | | | | |
| 2 | 62 | 50½ | 2 | 40½ | 27½ |
| 2½ to 4 | 66 | 54½ | 2½ to 4 | 43½ | 31½ |
| 4½ to 6 | 65 | 53½ | 4½ to 6 | 42½ | 30½ |
| 7 to 8 | 61 | 47½ | 7 to 8 | 35½ | 23½ |
| 9 to 12 | 55 | 41½ | 9 to 12 | 30½ | 18½ |

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

**WROUGHT PIPE**—Warehouse discounts as follows:

| | New York | | Cleveland | | Chicago | |
|---|---|---|---|---|---|---|
| | Black | Galv. | Black | Galv. | Black | Galv. |
| 1 to 3 in. steel butt welded. | 66% | 53% | 60½% | 47½% | 62½% | 48½% |
| 2½ to 6 in. steel lap welded. | 61% | 47% | 58½% | 44½% | 59½% | 45½% |

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 10%. Cast iron, standard sizes, 32–5% off.

**MISCELLANEOUS**—Warehouse prices in cents per pound in 100-lb. lots:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Open hearth spring steel (base) | 4.50 | 6.00 | 4.50 |
| Spring steel (light) (base) | 6@8 | 6.00 | 6.00 |
| Coppered Bessemer rods (base) | 7.00 | 8.00 | 6.85 |
| Hoop steel | 3.75 | 3.50 | 3.48 |
| Cold rolled strip steel | 6.25 | 8.25 | 6.15 |
| Floor plates | 4.80 | 4.66 | 5.08 |
| Cold finished shafting or screw | 3.50 | 3.30 | 3.40 |
| Cold finished flats, squares | 4.00 | 3.80 | 3.90 |
| Structural shapes (base) | 2.80 | 2.66 | 2.68 |
| Soft steel bars (base) | 2.70 | 2.56 | 2.58 |
| Soft steel bar shapes (base) | 2.70 | 2.56 | 2.58 |
| Soft steel bands (base) | 3.35 | 3.06 | 3.23 |
| Tank plates (base) | 2.80 | 2.66 | 2.38 |
| Bar iron (2.20 at mill) | 2.70 | 2.21 | 2.28 |
| Drill rod (from list) | 55@60% | 55% | 50% |
| Electric welding wire: | | | |
| 5/32 | 8.00 | | 12@13 |
| ¼ | 6.50 | | 11@12 |
| 5/32 to ¼ | 6.25 | | 10@11 |

## METALS

Current Prices in Cents Per Pound

| | |
|---|---|
| Copper, electrolytic (up to carlots), New York | 14.62½ |
| Tin, 5-ton lots, New York | 32.25 |
| Lead (up to carlots), St. Louis, 5.50; New York | 6.00 |
| Zinc (up to carlots), St. Louis, 5.80; New York | 6.30 |

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Aluminum, 98 to 99% ingots, 1-15 ton lots | 19.20 | 20.00 | 18.00 |
| Antimony (Chinese), ton spot | 5.50 | 7.50 | 6.25 |
| Copper sheets, base | 21.00 | 21.50@21.75 | 23.00 |
| Copper wire (carlots) | 16.50 | 17.50 | 16.25 |
| Copper rods (ton lots) | 19.50 | 22.50 | 19.50 |
| Copper tubing (100-lb. lots) | 23.75 | 24.50 | 23.00 |
| Brass sheets (100-lb. lots) | 17.25 | 18.50 | 18.75 |
| Brass tubing (100-lb. lots) | 21.00 | 21.00 | 20.50 |

# —Shop Materials and Supplies

## METALS—Continued

| | | | |
|---|---|---|---|
| Brass rods (1,000-lb. lots) | 15.25 | 21.50 | 15.75 |
| Brass wire (carlots) | 17.75 | 17.75 | ..... |
| Zinc sheets (casks) | 8.50 | ..... | ..... |
| Solder (½ and ½), (caselots) | 23.00 | 22.00 | 20.00 |
| Babbitt metal (fair grade) | 24.25 | 41.50 | 36.00 |
| Babbitt metal (commercial) | 11.00 | 16.00 | 9.00 |
| Nickel (ingot and shot), Bayonne, N. J. | 36.00 | ..... | ..... |
| Nickel (electrolytic), Bayonne, N. J. | 39.00 | ..... | ..... |

**SPECIAL NICKEL AND ALLOYS**—Price in cents per lb.

| | |
|---|---|
| Malleable nickel ingots | 45 |
| Malleable nickel sheet bars | 47 |
| Hot rolled rods, Grades "A" and "C" (base) | 50 |
| Cold drawn rods, Grades "A" and "C" (base) | 60 |
| Copper nickel ingots | 37 |
| Hot rolled copper nickel rods (base) | 45 |
| Manganese nickel hot rolled (base) rods "D"—low manganese | 54 |
| Manganese nickel hot rolled (base) rods "D"—high manganese | 57 |

Base price of monel metal in cents per lb., f.o.b. Bayonne, N. J.:

| | | | |
|---|---|---|---|
| Shot | 32.00 | Hot rolled machined rods (base) | 48.00 |
| Blocks | 32.00 | Hot rolled rods (base) | 40.00 |
| Ingots | 38.00 | Cold drawn rods (base) | 50.00 |
| Sheet bars | 40.00 | Hot rolled sheets (base) | 45.00 |

**OLD METALS**—Dealers' purchasing prices in cents per pound:

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Copper, heavy, and crucible | 12.00 | 11.50 | 11.50 |
| Copper, heavy, and wire | 11.75 | 11.00 | 10.50 |
| Copper, light, and bottoms | 9.75 | 9.50 | 9.75 |
| Lead, heavy | 4.75 | 4.50 | 4.75 |
| Lead, tea | 4.25 | 3.50 | 3.75 |
| Brass, heavy | 7.00 | 6.00 | 7.00 |
| Brass, light | 6.00 | 5.00 | 6.00 |
| No. 1 yellow brass turnings | 6.50 | 6.00 | 6.50 |
| Zinc | 3.00 | 3.00 | 3.00 |

**TIN PLATES**—American Charcoal Plates—Bright—Cents per lb.

| | | New York | Cleveland | Chicago |
|---|---|---|---|---|
| "AAA" Charcoal Melyn Grade: | | | | |
| IC, | 20x28, 112 sheets | 20.00 | 18.25 | 18.50 |
| IX, | 20x28, 112 sheets | 23.00 | 21.00 | 20.90 |
| "A" Charcoal Allaways Grade: | | | | |
| IC, | 20x28, 112 sheets | 17.00 | 16.00 | 17.00 |
| IX, | 20x28, 112 sheets | 20.00 | 18.75 | 19.60 |
| Coke Plates, Bright | | | | |
| Prime, 20x28 in.: | | | | |
| 100-lb., | 112 sheets | 12.50 | 11.00 | 14.50 |
| IC, | 112 sheets | 12.80 | 11.40 | 14.80 |
| Terne Plate | | | | |
| Small lots, 8-lb. Coating: | | | | |
| 100-lb., | 14x20 | 7.00 | 5.60 | 7.25 |
| IC, | 14x20 | 7.25 | 5.85 | 7.40 |

## MISCELLANEOUS

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Cotton waste, white, per lb. | $0.07½@$0.10 | $0.12 | $0.11½ |
| Cotton waste, mixed, per lb. | .055@.09 | .09 | .08 |
| Wiping cloths, 13¼x13¼, per lb. | .075 | .10 | .10 |
| Wiping cloths, 13¼x20½, per lb. | .08 | .11 | .13 |
| Sal soda, 100 lb. lots | 2.80 | 2.40 | 2.65 |
| Roll sulphur, 360 lb. bbl., per 100 lb | 2.85 | 3.25 | 3.50 |
| Linseed oil, per gal., 5 bbl. lots | .93 | 1.15 | 1.01 |
| White lead, dry or in oil | 100 lb. kegs. | New York, 12.50 | |
| Red lead, dry | 100 lb. kegs. | New York, 12.50 | |
| Red lead, in oil | 100 lb. kegs. | New York, 14.00 | |
| Fire clay, per 100 lb. bag | | .80 | 1.00 |
| Coke, prompt furnace, Connellsville | per net ton | $10.50@11.00 | |
| Coke, prompt foundry, Connellsville | per net ton | 10.50@11.00 | |

## SHOP SUPPLIES

Current Discounts from Standard Lists

| | New York | Cleveland | Chicago |
|---|---|---|---|
| Machine Bolts: | | | |
| All sizes up to 1x30 in. | 50% | 65-10% | 60% |
| 1½ and 1¼x3 in. up to 12 in. | 33⅓% | 60% | 60-10% |
| With cold punched sq. nuts | 35% | ..... | .... |
| With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%) | 40% | ..... | $4.00 off |
| Button head bolts, with hex. nuts | 25% | $3.90 net | ..... |
| Hex. head and hex. nut bolts | 30% | ..... | 65-5% |
| Lag screws, coach screws | 50% | ..... | 60-5% |
| Square and hex. head cap screws | 70-10% | 75% | 70-10% |
| Carriage bolts, up to 1 in. x 30 in. | 40% | 60% | 50-5% |
| Bolt ends, with hot pressed nuts | 50% | ..... | 55% |
| Tap bolts, (h.h. plus std. extra of 10%) | 10% | ..... | ..... |
| Semi-finished nuts ⅝ and larger | 65% | 70-10% | 80% |
| Case-hardened nuts | 60% | ..... | ..... |
| Washers, cast iron, ½ in., per 100 lb. (net) | $4.50 | $3.50 | $3.50 |
| Washers, cast iron, ⅝ in. per 100 lb. (net) | 3.75 | 3.50 | 3.50 |
| Washers, round plate, per 100 lb. Off-list | 3.50 | .... | 3.50 net |
| Nuts, hot pressed, sq., per 100 lb. Off list | 2.00 | 3.50 | 4.00 |
| Nuts, hot pressed, hex., per 100 lb. Off list | 2.00 | 3.50 | 4.00 |
| Nuts, cold punched, sq., per 100 lb. Off list | 2.00 | 3.50 | 4.00 |
| Nuts, cold punched, hex., per 100 lb. Off list | 2.00 | 3.50 | 4.00 |
| Rivets: | | | |
| Rivets, 7/16 in. dia. and smaller | 60-5% | 70% | 60-10% |
| Rivets, tinned | 60-5% | 70% | 4½c. net |
| Button heads ⅜-in., ½-in., 1x2 in. to 5 in., per 100 lb (net) | $4.00 | $3.25 | $3.10 |
| Cone heads, ditto (net) | 4.10 | 3.35 | 3.20 |
| 1½ to 1¾-in. long, all diameters, *EXTRA* per 100 lb | 0.25 | ..... | 0.15 |
| ⅜ in. diameter *EXTRA* | 0.15 | ..... | 0.15 |
| ½ in. diameter *EXTRA* | 0.50 | ..... | 0.50 |
| 1 in. long, and shorter *EXTRA* | 0.50 | ..... | 0.50 |
| Longer than 5 in. *EXTRA* | 0.25 | ..... | 0.25 |
| Less than 200 lb. *EXTRA* | 0.50 | ..... | 0.50 |
| Countersunk heads *EXTRA* | 0.35 | ..... | $3.35 base |
| Copper rivets | 55-5% | 50% | 50-% |
| Copper burs | 35% | 50% | 20% |

| | | | |
|---|---|---|---|
| Lard cutting oil (50 gal. bbl.) per gal. | $0.55 | $0.50 | $0.67½ |
| Machine lubricant, medium-bodied (50 gal. bbl.), per gal. | 0.33 | 0.35 | 0.40 |
| Belting—Present discounts from list in fair quantities (½ doz. rolls). | | | |
| Leather—List price, New York, per ply, 12-in. wide, per lin. ft., $2.88: | | | |
| Medium grade | 40-5% | 40-10-2½% | 50% |
| Heavy grade | 35% | 40% | 40-5% |
| Rubber and duck: | | | |
| First grade | 60-5% | 50-10% | 40-10% |
| Second grade | 60-10-5% | 60-5% | 60-5% |
| Abrasive materials—In sheets 9x11 in.: | | | |
| No. 1 grade, per ream of 480 sheets, | | | |
| Flint paper | $5.84 | $3.85 | $6.48 |
| Emery paper | 8.80 | 11.00 | 8.80 |
| Emery cloth | 27.84 | 32.75 | 29.48 |
| Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, | 4.50 | ..... | 4.95 |
| Emery discs, 6 in. dia., No. 1 grade, per 100. | | | |
| Paper | 1.32 | ..... | 1.40 |
| Cloth | 3.02 | ..... | 3.20 |

# New and Enlarged Shops

## Machine Tools Wanted

**Conn., Ansonia**—Westwood Garage, Riggs St., F. E. Warfel, Purch. Agt.—one small lathe suitable for turning off commutators—ignition work.

**Conn., Bridgeport**—Connecticut Marine Boiler Wks., 64 Kossuth St., W. G. Wilson, Purch. Agt.—self-acting tapping device for use on drilling machine.

**Conn., Bridgeport**—International Silver Co., 874 Crescent Ave.—power press with balance wheel stroke 2 in. (used).

**Conn., Bridgeport**—Lakeview Auto Co., 860 Boston Ave., J. C. Bednar, Purch. Agt.—drill press, tool grinder, small lathe, and electric motor.

**Conn., Bridgeport**—The Sprague Meter Co., 203 Water St. J. McCoy, Purch. Agt.—squaring shear, about 34 in. for tin and sheet metal.

**Conn., Bridgeport**—**A.** Warren, 704 Iranistan Ave. (electric novelties)—one small lathe.

**Conn., Bridgeport**—**J. E.** Wheway, 43 Rosedale St.—small lathe for mechanical work.

**Conn., Shelton**—Specialty Bolt & Rivet Wks., 132 Hillside Ave., A. Perry, Purch. Agt.—one surface grinder, with magnetic chuck; thread chasing machine; machine for making rolled threads.

**Ky., Lexington**—Erd Mfg. Co., 117 Sherman Ave., address R. L. Erd, Pres.—equipment for machine shop.

**Mich., Muskegon**—The Shaw-Walker Co., West Western Ave.—one 36 in. power shear for 16 gage metal.

**Mo., Kansas City**—Schroer Bros., 1681 Delaware St.—one 18 in. lathe for power equipment.

**N. Y., Buffalo**—Bd. of Educ., 1401 Telephone Bldg., will receive bids until Aug. 2—variety saw, grinder, lathes, motor, anvil, oven furnace, printing shop presses and cases. Noted July 20.

**N. Y., Buffalo**—D. Metlin, Cherry and Hickory Sts.—small tools and equipment for proposed garage.

**N. Y., Irvington-on-the-Hudson**—Burnham Boiler Corp.—machinery and equipment for foundry and machine shop at Lancaster, Pa.

**N. Y., Rochester** — N. Sablewiski, 949 Hudson Ave.—small tools and equipment for garage repair shop, to be constructed at 975 Hudson Ave.

**O., Columbus**—Hamilton Engineering Co., Schultz Bldg., manufacturer of conveyors and feeders—complete line of machine tools for new factory.

**O., Lorain**—Seneca Piston Ring Co., 1084 Bway., J. H. Davis, Purch. Agt.—general shop machinery, including lathe, press, grinder and shaper.

**Pa., Chester**—Textile Mchy. Co., 14th and Esrey St.—equipment for machine shop including lathes, planers, drills, etc.

**Pa., Farrell**—Bd. of Educ.—machinery and equipment for machine shop and woodworking department of proposed school.

**Pa., Phila.**—Elgin Machine & Tool Wks., 223 North 4th St.—one screw press with bed to take 20 in. work.

**Pa., Phila.**—C. P. Hoffman Co., 215 Cuthbert St.—additional electro plating machinery, small drill press, etc.

**Pa., Phila.**—Horn & Brannen Mfg. Co., 427 North Broad St. (gas and electric fixtures)—automatic cut off saws, drills, presses, and plating machinery.

**Pa., Phila.**—M. J. Hunt Sons Co., 251 Richmond St.—one large power shear.

**Pa., Phila**—H. T. Potts Iron & Steel Mfg. Co., 316 North 3rd St.—equipment for machine shop including shears, drills, presses, etc.

**Pa., Phila.**—Reyburn Mfg. Co., 32nd St. and Allegheny Ave. (manufacturer of metal tags)—two plane power punch presses.

**Pa., Pittsburgh**—Jackson-Remlinger, Manufacturers Bldg.—power punching machine.

**Pa., Pittsburgh**—M. G. Spaulding, 574 Union Arcade Bldg.—one 5 in. Ajax upsetter; one 5 in. Ajax roll; one 2,000 lb. single frame forge hammer; two 85 lb. cushion hammers; one 200 lb. upright hammer (steam or air); one 7 lb. Cleveland or Hillis & Jones blanking punch.

**Pa., West Scranton** (Scranton P. O.)—Apollo Garage, F. P. Spiegel (owner)—small machinery, tools and equipment for garage and repair shop.

**Pa., Williamsport**—Supply Committee, School Bd., H. A. Sterner, Secy., receives bids until Aug. 2, for following equipment for High School—

One single spindle high speed drill to be equipped with 220 volt, two phase, 60 cycle driving motor.

One metal planer 24″ by 24″ by 8′ arranged for belt drive, *or*

One metal planer 24″ by 24″ by 8′ arranged for motor drive, including a 220 volt, two phase, 60 cycle motor.

One Stewart oven furnace No 28 with pyrometer opening in the rear wall.

One electric driven center grinder for lathe center grinding, to be equipped with 220 volt, two phase, 60 cycle motor.

One universal milling attachment arranged to fit a Garvin No. 1 Universal Milling Machine.

One engine lathe, back geared, arranged for belt drive, to swing 20″ over the bed, with bed at least 6′ long.

One No. 1½ plain milling machine with power longitudinal and power cross feeds, arranged for belt drive.

One ten inch four jaw chuck, Skinner No. 1910 or equal.

Two ten inch three jaw universal chucks, Skinner No. 3410 or equal.

One low pressure acetylene generator with a capacity of one hundred feet of acetylene per hour, with back pressure valve.

One welding blowpipe 22″-24″ long with five welding heads for welding work ranging from ¼″ to 1″ in thickness.

One oxygen welding regulator with two gauges.

One cutting torch with 90 deg. head and four nozzles for work ranging from ¼″ to 12″ in thickness.

One oxygen cutting regulator with two gauges.

**Tex., Austin**—Capitol Engraving Co., 901 Congress St.—power lathe.

**Tex., Dallas**—V. Hafner, Lobby Interurban Bldg.—jewelers lathe (small), drill press, also equipment for engraving, polishing and buffing, belting, and small motor.

**Va., Keysville**—J. L. Pearson—woodworking machinery, including jointer, tenoner, sander and lathe (used).

**Va., Norfolk**—J. E. Doherty, 2405 Granby St.—full line of machinery and equipment for garage, including lathes, drills, reamers, punches, etc.

**Va., Richmond**—W. P. Atkinson Co., 322 West Broad St.—complete line of machinery for auto repair shop on Meadow and Broad Sts.

**Va., Richmond**—F. L. Benton, 1649 West Broad St.—general repair machinery for new auto service shop.

**Va., Richmond**—Broad St. Service Co., 313 West Broad St.—one 6 in. bench vise and electric drill.

**Va., Richmond**—A. J. Fleming Co., 1623 West Broad St. (cylinder grinding and machinery repair work)—one lathe.

**Va., Richmond**—Franklin Motor Co., 2007 West Broad St.—one drill press, lathe and arbor press.

**Va., Richmond**—Fulton & Barnes, 1643 West Broad St.—combination drill press, milling machine and lathe for auto service station.

**Va., Richmond**—C. S. Gibson, 1811 West Broad St.—repair machinery, lathe and drill press for auto service station.

**Va., Richmond**—The Owens Motor Co., 2100 West Broad St.—one lathe and drill press.

**Va., Richmond**—Professional Auto Repair Shop, 1629 West Broad St.—one lathe, drill press and machinery for auto repair shop.

**Wis., Kenosha**—Buick Garage Co., 915 Salem Ave., M. Kisten, Purch. Agt.—machinery for auto repairing.

**Wis., Milwaukee**—G. Benning, 714 21st St.—double drum sander and 8 in. sticker.

**Wis., Milwaukee**—F. Grabowski, 420 Mitchell St.—sheet metal working machinery including brakes, beaders, etc.

**Wis., Milwaukee**—C. Kirchan, 823 47th St. (experimental tool work)—lathes, drill presses and grinders.

**Wis., Milwaukee**—Layton Park Motor Co., c/o H. W. Kracht, 1547 9th St.—drill press, burning-in machine, and emery wheel.

**Wis., Richfield**—Laubenheimer Garage Co.—lathe, drill press, air compressor, and gas storage tank.

**B. C., Vancouver**—Ideal Iron Wks., 123 Powell St.—equipment for proposed machine shop.

**Ont., London**—J. W. McLaughlin, 629 Queens Ave.—complete equipment for garage and auto repair shop.

**Ont., Montrose**—Canadian Axolite Co.—equipment for machine shop addition, for automobile repair shop.

## Machinery Wanted

**Ala., Birmingham**—Gould Mfg. Co., Inc., c/o F. E. Gould—machinery for the manufacture of windshields for automobiles and motor boats.

**Cal., Los Angeles**—Mining & Oil Equipment Co., 2026 Santa Fe St.—reclaiming equipment.

**Cal., Santa Barbara**—High School Trustees, c/o School Bd.—equipment for manual training department of proposed high school.

**Col., Delta**—Stearns Bros.—four magazines for 3 linotype machines.

**Col., Idaho Springs**—Cycle Mining Co.—equipment for compressor plant (now under construction).

**Conn., Hartford**—Acme Bedding Co., 94 Brown St.—equipment for factory addition.

**Conn., Hartford**—Bd. of Contract and Supply, Municipal Bldg., W. F. O'Neill, Secy.—receiving bids until Aug. 1, laundry equipment for Isolation Hospital.

**Fla., Jacksonville**—Jacksonville Products Co., Pearl St., J. E. Griffith, Purch. Agt.—complete line of machinery and equipment for fruit preserving plant.

**Fla., Moore Haven**—Glades County Democrat & Printing Co., W. Stephens, Mgr.—printing equipment and machinery including hand and power presses, cutters, etc. (new or used).

**Fla., Orlando**—Fletcher & Crawford Co., West Concord St.—machinery and equipment for the manufacture of concrete building blocks (new or used).

**Ill., Chicago**—M. M. Rothschild, 717 Federal St.—two color press.

**Ill., Rockford**—Rockford Malleable Iron Co., Peoples Ave.—annealing ovens.

**Ind., Huntington**—The Whitlock Press, Inc., 5 North Jefferson St.—two No. 3 Meihle presses.

**Kan., Wichita**—J. Hill, 618 South Water St.—job printing press (power).

**Kan., Wichita**—Smith Clark Furniture Co., 254 North Main St.—multigraph machinery and other printing equipment.

**Ky., Louisville**—Kentucky Steel & Wire Co., A. H. Dillon, Pres.—machinery and equipment for the manufacture of wire nails, staples and other wire products.

**La., Baton Rouge**—Wright Steam Motor Mfg. Co., J. B. Wright, Genl. Mgr.—machinery and equipment for new plant.

**Me., Portland**—Confederated Home Abbatoir Corp.—machinery and equipment for proposed abbatoir in Bethlehem, Pa.

**Md., Baltimore** — McLaughlin Radio & Electric Corp., c/o G. R. Allen—machinery and equipment for the manufacture of radio apparatus and supplies.

**Md., Baltimore**—S. T. Williams, 223 North Calvert St.—cable way hoisting engine with winding drum and endless rope drum for electric drive, with or without motor, 35 to 40 hp., also electrically driven air compressor suitable for about 3 jack drills, with or without motor (3 phase, 60 cycle, 220 volts, A.C.).

**Mich., Detroit** — Four Wheel Hydraulic Brake Co., 708 Harper Ave.—miscellaneous equipment for plant expansion.

**Mich., Detroit**—Packard Motor Car Co., Boulevard and Belt Line Ry.—mechanical conveyor for shipping shed.

**Mich., Detroit**—J. Tekiell, 9201 Home St. —circular log sawmill complete (used).

**Mich., Hamtramck** (Detroit P. O.)—City of Hamtramck, J. J. Mitchell, Clk.—one 100 lb. portable air compressor, 4 cylinder 40 hp. gasoline motor, 20 gal. fuel tank, 12 cu.ft. air receiver.

**Mich., Highland Park** (Detroit P. O.)—Ford Motor Co.—equipment for the manufacture of tractor parts, also for assembly plant.

**Mich., Highland Park** (Detroit P. O.)—Ford Motor Co.—gyratory crusher, conveyors, elevator bins, revolving screen shaking grizzly, cyclone system, for proposed slag crusher building at River Rouge.

**Minn., St. Paul**—The State Bd. of Control, Capitol, D. F. Mullen, Secy.—machinery for the manufacture of butter, cheese, ice cream, etc., for dairy at College of Agriculture, University of Minnesota.

**Mo., Kansas City**—Erickson Garage No. 2, 3701 Main St.—air compressor, belting and pulleys.

**Neb., Emerald**—Emerald Motor Co., M. Luhlutz, Purch. Agt.—one 150 lb. compressor for service station.

**Neb., Lincoln**—J. H. Markel Motor Car Co., 12th and Q Sts., W. F. Boys, Mgr.—electric test stand suitable for work on "North East" starting motors, with attachments for other make starters.

**N. Y., Buffalo**—Angert Auto Parts Corp., 601 Bailey Ave., S. Angert, Pres.—equipment for wrecking automobiles and repairing parts, (for plant on Seneca St.).

**N. Y., Buffalo**—Barrett Bros., 628 South Park Ave.—one 1,000 gal. gasoline tank and pump.

**N. Y., Buffalo**—E. P. Benner, 106 Verplanck St.—equipment for bakery at 573 South Park Ave.

**N. Y., Buffalo**—I. W. Dixon, 43 Briggs Ave.—machinery and equipment for curing boots and auto tires for proposed factory at 1152 Michigan Ave.

**N. Y., Buffalo**—J. Schaaf, 159 Willis Ave.—machinery and equipment for shoe factory at 947 Northampton St.

**N. Y., Buffalo**—R. Simone, 172 Terrace St. —equipment for the manufacture of confectionery and pastry.

**N. Y., Dunkirk**—Bd. of Educ., J. J. Madigan, Secy.—receiving bids until Aug. 14 for complete vocational equipment.

**N. Y., Elmira**—Elmira Water, Light & R. R. Co., F. H. Hill, Genl. Mgr.—machinery, cooling apparatus and other equipment for new gas manufacturing plant.

**N. Y., Jamestown**—Jamestown Malleable Products Corp., Tiffany Ave., H. E. Kies, Genl. Mgr.—annealing ovens, machinery and equipment for iron products plant.

**N. Y., Newark**—Marion Union Free School Dist., A. M. Croop, 6 Moore St., Supt.—vocational equipment (complete), for school.

**N. Y., Ontario**—Ontario Co-operative Packing Assn., R. Gates, Purch. Agt.—machinery and equipment for large packing house including grading machines.

**N. Y. Wolcott**—Wolcott Co-operative Assn., Inc., H. V. Wilson, Dir.—machinery and equipment for fruit packing plant.

**N. C., China Grove**—China Grove Cotton Mills Co.—machinery and equipment for proposed 16,000 spindle cotton mill.

**N. C., Forney**—Norwood Lumber Co.—trim saw for use in the manufacture of hardwood flooring, door and window casings, etc., (new or used).

**N. C., Mt. Olive**—B. E. Martin, (woodworking)—veneering machine and jointer (used).

**N. C., Raleigh**—Sanitary Laundry Co., South Blount St.—machinery for laundry on South McDougal St.

**N. C., Tarboro**—M. P. Williams—power job press and paper cutter.

**O., Akron**—International Lead Co., Betts Corners—machinery and equipment for $500,000 lead manufacturing plant now in course of construction.

**O., Fremont**—Safe Storm Shield Co.—machinery and equipment for proposed factory.

**O., McArthur**—Happy Home Washing Machine Co.—machinery and equipment for plant at Logan, O.

**O., Niles**—C. Bradford—equipment for bakeshop on Short St.

**O., Norwalk**—A. B. Chase Piano Co. (subsidiary of the United Piano Co.)—machinery and equipment for piano factory here.

**O., Sebring**—French China Co., O. H. Sebring (owner)—complete equipment and machinery for addition to china ware factory.

**O., Sebring**—Strong Enamel Mfg. Co., O. H. Sebring, Pres.—machinery and equipment for the manufacture of aluminum ware.

**O., Warren**—K.-W. Brick Co., (manufacturer of slag brick), R. W. Swift, Genl. Mgr.—machinery and equipment (complete) for the manufacture of bricks, including special brick presses, pulverizers, etc. (capacity 40,000 bricks per day).

**O., Warren**—Downs Studio, 15 West Market St.—complete steam vulcanizing outfit.

**O., Zanesville**—F. A. Jones Stone Co., 616 Forest Ave.—machinery and equipment for quarrying 40 acres of stone deposits at Martinsburg, W. Va.

**Okla., Shawnee**—F. Armstrong, 125 North Bell St.—one job press, newspaper press, linotype, belting, hangers, pulleys, beamings, metal cutter, shafting, and motors.

**Okla., Supply**—Republican—one 6 column folio drum cylinder press.

**Pa., Clifton Heights**—Caledonia Woolen Mill, J. S. Stewart, Purch. Agt.—drying machinery, vats, etc. for dyeing plant.

**Pa., Lambertville**—Lambertville Home Bakery—equipment for bakeshop.

**Pa., New Castle**—Buckeye Overall Co., M. Fisher, Purch. Agt.—machinery and equipment for factory.

**Pa., New Castle**—Pennsylvania Wireless Mfg. Co., Inc., R. Patch, Genl. Mgr.—machinery and equipment for the manufacture of wireless telephones, radio outfits and supplies, for factory on Florence Ave.

**Pa., Oxford**—Oxford Press—one 7 column Cottrell press, also newspaper folder 35 x 44 in.

**Pa., Phila.**—A. T. Baker & Co., Fountain and Canal Sts. (manufacturer of textiles) —steam vats, drying machines, and other dyeing machinery.

**Pa., Phila.**—Bureau of Water, Room 696 City Hall, C. E. Davis, Purch. Agt.—two 3 ton traveling cranes (overhead); 7 portable Pitot recording outfits; 6 Pitot rods and manometers.

**Pa., Pittsburgh**—Hardie Bros. Co., 1601 Liberty St.—machinery and equipment for proposed candy factory on 13th and Pike Sts.

**Pa., Pittston**—Howell & King Co., corner Crown and Thomas Sts., P. F. Joyce, Pres. —machinery and equipment for proposed artificial ice plant.

**Pa., Wellsboro**—Wellsboro Shale Brick Co., A. Wandroik, Purch. Agt.—machinery and equipment for shale brick plant including equipment for elevated railway and machinery for conveying shale to plant.

**Tex., Beaumont**—Neches Printing Co.—Kelly or Miller unit and other printing equipment.

**Tex., Dallas**—R. F. Smith, 212 West 8th St. (job printer)—power paper cutter (large).

**Tex., Sweetwater**—Pioneer Planing Mill Co.—woodworking machinery, sash and doors machinery, pulleys, belting, hangers, shafting, cutting off machinery, etc.

**Tex., Tyler**—A. Hicks—Crescent universal woodworker No. 51 and 59, belting, motor, hangers, shafting, and other equipment for woodworking plant.

**Va., Clarksville**—Clarksville Farmers Implement & Supply Co., H. A. Noblin, Secy.—will soon receive bids for machinery for proposed plant.

**Va., Purcellville**—Loudon County Milling Co.—machinery for proposed flour mill.

**Va., Richmond**—Stuart Fouck Co., 1611 West Broad St.—machinery for repairs (price lists).

**Va., Riverton**—Riverton Mills Corp., W. G. Dearing, Front Royal, Sec.—machinery for fertilizer plant.

**W. Va., Fairmount**—Allied Lumber Corp., A. J. Colburn, Purch. Agt.—machinery and equipment for the manufacture of lumber and mill products.

**W. Va., Huntington**—Huntington Candy Co., Inc., H. L. Cook, Pres.—machinery and equipment for the manufacture of candy.

**W. Va., Weirton**—R. L. Gates—woodworking machinery.

**Wis., Eau Claire**—Lange Canning Co., Mill and West Madison Sts., F. N. Herrick, Purch. Agt.—canning machinery.

**Wis., Madison**—The Bd. of Educ.—manual training equipment and woodworking machines.

**Wis., Milwaukee**—Consolidated Materials Co., 301 Caswell Blk., is receiving bids on the following equipment for gravel pit at Delafield: washing plant, crusher (25-30 hp.), pumps, screens, bucket conveyor, belt conveyor, steam engine or electric motor power.

**Wis., Neenah**—C. A. Douglas, 251 East Dewey Ave. (filling station and garage)—oil and gasoline pumps, storage tanks, and air pump for tires.

**Wis., Oshkosh**—Kuebler Grocery Co., 282 Main St., Auler & Jensen, Oshkosh, Archts. —ice machine and refrigerating apparatus (owner and architect receiving bids).

**Wis., Racine**—Wisconsin Cream of Corn Co., 501 6th St., J. G. Leuker, Purch. Agt.—canning machinery.

**Wis., Sheboygan**—Dillingham Mfg. Co., South 13th St. and Wisconsin Ave.—equipment for dry kiln.

**Ont., Hamilton**—Penninsula Cord Tire Co., 45 John St., S.—equipment for the manufacture of tires.

**Ont., Niagara Falls**—Elton Knitting Mills, c/o Chamber of Commerce—machinery and equipment for proposed woolen goods plant.

**Ont., Welland**—Dodds Canadian Iron Wks., Ltd.—equipment for proposed iron works.

**Ont., Welland**—S. L. Lambert—machinery and equipment for lumber and saw mill.

**Ont., Welland**—Welland Packing Co., Ltd., F. Ahrnan, Pres.—machinery and equipment for packing house.

## Metal Working Shops

**Cal., Oakland**—The Starr Motor Co. of California, c/o Durant Motor Co., East 14th St., has awarded the contract for the construction of an 80 x 150 ft. administration building, and a 100 x 200 ft. warehouse, on East 14th St. Estimated cost (plant completed) $1,000,000.

**Cal., San Jose**—Central Improvement Co., has awarded the contract for the construction of a 2 story auto stage depot and store building on Market St. Estimated cost $41,715. Peninsula Rapid Transit Co., San Jose or 5 5th St., San Francisco, lessee.

**Cal., Taft**—Taft Union High School Dist. is having plans prepared for the construction of additions to its High School. Immediate building plans include a garage, and it is proposed by the first of the year to complete machine and auto shop.

**Ind., Indianapolis**—Zenite Metal Co., 201 North West St., has awarded the contract for the construction of a 1 story, 100 x 200 ft. factory. Estimated cost $100,000.

**Ind., Michigan City**—Sullivan Mchy. Co., 122 South Michigan St., Chicago, has awarded the contract for the construction of a 1 and 2 story, 400 x 550 ft. manufacturing plant and 50 x 400 ft. power and central heating plant. Estimated cost $1,000,000. Noted July 6.

**Ky., Lexington**—Erd Mfg. Co., 117 Sherman Ave., is having plans prepared for the construction of a 1 story, 50 x 100 ft. machine shop. R. L. Erd, Pres. F. P. Smith, Lexington, Archt.

**Md., Cumberland**—N. & G. Taylor Co., Inc., 300 Chestnut St., Phila., has awarded the contract for the construction of a 1 story addition to tin house and foundry, here.

**Mich., River Rough** (Detroit P. O.)—Ford Motor Co., Highland Park, plans to build a 5 story, 60 x 300 ft. tractor and automobile factory addition, here. A Kahn, 1,000 Marquette Bldg., Detroit, Archt.

**N. J., Camden**—N. B. T. Rooney, 503 Market St., has awarded the contract for the construction of a 2 story, 52 x 100 ft. service station and garage on Hadden and Sycamore Aves. Estimated cost $50,000. A. B. Gill, Law Bldg., Archt.

**N. J., Trenton**—The Hulslander Engraving Co., 8 North Stockton St., will build a 4 story, 47 x 143 ft. engraving plant. H. A. Hulslander, Pres.

**N. Y., Buffalo**—J. Schaaf, 947 Northampton St., plans to build a specialty factory and shop. Estimated cost $75,000. Private plans.

**N. Y., Waterford**—C. L. Cadle, Supt. of Pub. Wks., Capitol, Albany, will soon award the contract for the construction of shops, here, and also at Baldwinsville and Pittsford. Estimated cost $105,000.

**O., Akron**—International Lead Refining Co., 151st St. and McCook Ave., East Chicago, Ind., will soon receive bids for the construction of a refinery including 4 buildings, on Tallmadge Ave., here. Estimated cost $500,000.

**O., Akron**—M. O'Neil of the General Tire & Rubber Co., has awarded the contract for the construction of a 2 story, 95 x 163 ft. garage on West Market St., to be leased to the Cadillac Co., 1881 Bway., New York City. Estimated cost $100,000. Noted June 13.

**O., Alliance**—H. W. Wagner, (Ford Agency) has awarded the contract for the construction of a 1 story, 50 x 100 ft. garage. Estimated cost $50,000. Private plans.

**O., Middleton**—Amer. Rolling Mill Co., East Side, plans to rebuild portion of its rolling mill which was destroyed by fire. Estimated cost $100,000. Architect not announced.

**Pa., Phila.**—J. Pinheiro, 1007 Race St., has awarded the contract for the construction of a 2 story, 94 x 100 ft. garage at 910 Spring St. Estimated cost $80,000.

**S. C., Greenville**—E. F. Bates, 309 North Main St., has awarded the contract for the construction of an automobile sales room and garage, area 8,500 sq. ft.

**Tex., Waco**—Missouri, Kansas & Texas R. R., plans to build a large locomotive repair shop here. Estimated cost $800,000. A. S. Johnson, 404 Times-Herald Bldg., Waco, Supt.

**Va., Clarksville**—Clarksville Farmers Implement & Supply Co., plans to build a manufacturing plant. H. A. Noblin, Secy.

**Wis., Beloit**—J. H. Sarris, 412 Broad St., has awarded the contract for the construction of a 1 and 2 story, 100 x 130 ft. garage. Estimated cost $55,000.

**Wis., Elkhorn**—F. Holton & Co. has awarded the contract for the construction of a 2 story, 42 x 60 ft. factory for the manufacture of band instruments. Estimated cost $25,000.

**Wis., Milwaukee**—Bahde Mfg. Co., 2621 Vine St., has awarded the contract for the construction of a 1 story, 32 x 86 ft. factory on 30th and Chambers Sts. for the development and manufacture of patented mechanical articles. Estimated cost $20,000. Noted July 13.

**H. T., Pearl Harbor**—The Bureau of Yards and Docks, Navy Dept., Wash., D. C., has awarded the contract for the completion of a machine shop at the Naval Base, here. Estimated cost $185,366.

**Ont., London**—J. W. McLaughlin, 629 Queens Ave., is having plans prepared for the construction of a garage and auto repair shop. Estimated cost $42,000.

**Ont., Welland**—Dodds Canadian Iron Wks. Ltd. plans to construct a large iron works. Private plans.

## General Manufacturing

**Cal., Merced**—Benham Ice Cream Co., 1420 H St., plans to build a 1 story, 50 x 100 ft. ice cream distributing plant on O and 16th Sts. Estimated cost $15,000. Architect not selected.

**Cal., Napa**—Growers Packing and Warehouse Co., Jackson St., a subsidiary of the California Prune & Apricot Growers Assn. has awarded the contract for the construction of a 141 x 144 ft. addition to its packing plant. Estimated cost $65,000. Noted June 29.

**Cal., San Francisco**—L. R. Lurie, Mills Bldg. is having plans prepared for the construction of a 3 story factory on Bryant St. near 2nd St. Hockwald Chemical Co., 531 Howard St., lessee O'Brien Bros., Inc., 240 Montgomery St., Achts.

**Cal., San Francisco**—The Natl. Ice Cream Co., 371 Guerrero St., has awarded the contract for the construction of a 1 story ice cream factory, in the Mission Dist. Estimated cost, $12,000. Noted April 13.

**Cal., San Francisco**—M. V. Politeo, Archt., 1st Natl. Bank Bldg., is receiving bids for the construction of a 1 story factory on Howard St. near 5th St., for Eames Co., 55 1st Ave., manufacturer of truck and wheel goods.

**Cal., Stockton**—A. S. Williams, secy. Bd. of Educ. will soon award the contract for the construction of a shop building, and other additions to high school. Estimated cost, $20,000. L. Stone, Belding Bldg., Archt.

**Cal., Stockton**—X-clusive Laundry, 427 East Lafayette St., to build a 1 story, 92 x 150 ft. laundry on Lafayette and California Sts. Estimated cost $50,000. Architect not selected.

**Conn., Hartford**—Acme Bedding Co., 94 Brown St., is having plans prepared for the construction of a 2 story, 45 x 70 ft. addition to its plant. Estimated cost $25,000. B. A. Sellew, 721 Main St., Engr. and Archt.

**Fla., Bradentown**—Manitee County Growers Assn. has had plans prepared for the construction of a 1½ story 50 x 150 ft. packing house adjoining both Seaboard and Atlantic Coast Line Ry. tracks. Estimated cost (exc uding equipment) $15,000. Johnson & Fonda, Bradentown, Archts.

**Ill., Chicago**—C. W. Lampe, Archt., 155 North Clark St., will soon receive bids for the construction of a 1 and 2 story, 80 x 100 ft. factory, for the manufacture of furniture at 1666 McHenry St., for Fenske Bros., c/o Architect. Estimated cost $20,000.

**La., Alexandria**—The City will soon receive bids for the construction of a gas plant and distributing system. Estimated cost $110,000.

**Mass., Holyoke**—The Farr Alpaca Co., Jackson St., have had plans prepared for the construction of a 6 story, 100 x 500 ft. yarn mill. Estimated cost $1,000,000. S. M. Greene & Co., 293 Bridge St., Springfield, Engrs. and Archts.

**Mich., River Rouge** (Detroit P. O.)—Ford Motor Co., Highland Park, has had plans prepared for the construction of a 2 story, 34 x 90 ft. slag crusher building for cement mill, here. Estimated cost $25,000. A. Kahn, 1,000 Marquette Bldg., Detroit, Archt

**Minn., St. Paul**—The State Bd. of Control, Capitol, will soon receive bids for the construction of a 3 story dairy (with 1 story wing) at the College of Agriculture, University of Minnesota. Estimated cost $210,000. D. F. Mullen, Secy. C. H. Johnston, 715 Capitol Bank Bldg., Archt.

**Minn., South St. Paul**—Katz & Horne Packing Co., South St. Paul and 352 East 6th St., has awarded the contract for the construction of a 3 story, 50 x 130 ft. packing plant. Estimated cost $130,000.

**N. J., Trenton**—F. A. Straus & Co., Johnston Ave., will build 2 and 3 story, 100 x 100 ft. and 80 x 187 ft. yarn factory additions. Estimated cost $150,000.

**N. Y., Jamestown**—Lockwood Greene & Co., Engrs., Hanna Bldg., Cleveland, O., is receiving bids for the construction of the first section of dyehouse and filter house for the Jamestown Worsted Mills, manufacturer of men's wear and women's dress goods. This will be followed later by second section of dyehouse and a 4 story manufacturing building for combing, drawing and roving mill.

**N. C., Raleigh**—Sanitary Laundry Co., South Blount St., plans to build a 2 story, 80 x 177 ft. laundry on South McDougal St. Estimated cost $50,000.

**O., Cleveland**—Ingraham Waste & Supply Co., 1539 Columbus Rd., is having plans prepared for the construction of a 1 story, 50 x 125 ft. warehouse and factory at 1450 Hamilton Ave. Estimated cost $50,000. W. E. Monsor, Pres.

**O., Cleveland**—M. Makoff, 551 Hippodrome Annex Bldg., is receiving bids and will open same about Aug. 1 for the construction of a 2 story, 32 x 64 ft. commercial and light manufacturing building. Estimated cost $40,000. A. F. Ganowitz, permanent Bldg., Archt.

**O., Sandusky**—Chamber of Commerce and the Ajax Rubber Co., plan to build a rubber manufacturing plant, here. Estimated cost $1,000,000. Private plans. Address Chamber of Commerce, Sandusky.

**O., Sebring**—Saxon China Co., South Side, plans to build additions to its pottery factory including 3 glass, 3 bisque and 4 decorating kilns. Estimated cost $100,000. Plans private.

**O., Warren**—K.-W. Brick Co., plans to build a factory, capacity 40,000 bricks per day. Estimated cost $50,000. R. Swift, Mgr. Architect not announced.

**Pa., Philadelphia**—R. R. Neely, Archt. 2126 Pine St., is receiving bids for the construction of a 3 story, 30 x 110 ft. factory for the manufacture of brushes, at 4712 Market St., for Harrison Brush Factory, 4th and Arch Sts. Estimated cost $45,000.

**Pa., Pittsburgh**—Atlantic Refining Co., Chamber of Commerce Bldg., has purchased a 7½ acre site adjoining its plant along the Allegheny River, and plans to extend its refinery, and erect numerous storage houses.

**Pa., Stroudsburg**—Nitroloid Corp. of Amer. plans to rebuild its celluloid manufacturing plant which was destroyed by fire. Estimated cost $250,000. Architect not announced.

**Tenn., Knoxville**—C. B. Johnson, West Main St., has awarded the contract for the construction of a 2 story, 75 x 175 ft. press and publishing house on Church St. Estimated cost $60,000.

**Tenn., Knoxville**—J. G. Sterchi plans to build a 3 story, 100 x 100 ft. factory for the manufacture of shirts, on Jackson Ave. Estimated cost $60,000. R. F. Graf & Sons, Arnstein Bldg., Engrs. and Archts.

**Va., Purcellville**—Loudon County Milling Co. plans to build a flour mill. Architect not selected. Estimated cost $30,000.

**Va., Riverton**—Riverton Mills Corp., is having preliminary plans prepared for the construction of a fertilizer plant. Estimated cost including machinery and equipment, from $30,000 to $40,000. W. G. Dearing, Front Royal, Secy.

**W. Va., Parkersburg**—General Porcelain Co. has awarded the contract for the construction of a 1 story, 65 x 225 ft. manufacturing plant.

**Wis., Cazenovia**—Cazenovia Creamery Co., c/o F. J. Mayes, Mgr., has selected a site and plans to build a 1 story, 60 x 150 ft. dairy. Estimated cost $40,000. Architect not selected.

**Wis., Delavan**—The State Bd. of Control, Capitol, Madison, has awarded the contract for the construction of a 1 story, 75 x 90 ft. laundry at State School for Deaf here. Estimated cost $50,000. M. J. Tappins, Secy. Noted July 6.

**Wis., Eau Claire**—Chippewa Valley Produce Co., 220 South Water St., has awarded the contract for the construction of a 2 story, 70 x 125 ft. cold storage warehouse. Estimated cost (including conveyors and cooling apparatus) $65,000.

**Wis., Madison**—F. Riley, Archt., Conklin Bldg., is receiving bids for the construction of a 2 story, 75 x 100 ft. manual arts building, for the Bd. of Educ.

**Wis., New London**—Amer. Plywood Co., has awarded the contract for the construction of a 2 story, 90 x 144 ft. unit to its veneer factory. Estimated cost $70,000. F. P. Zaug, Mgr. Private plans.

**Wis., Sheboygan**—Dillingham Mfg. Co., South 13th St. and Wisconsin Ave., and W. C. Weeks, Archt., 720 Ontario St., are receiving bids for the construction of a dry kiln.

**Ont., Hamilton**—Pennsula Cord Tire Co., 45 John St., S. plans to build a factory. Estimated cost $50,000.

**Ont., Welland**—S. L. Lambert plans to rebuild planing mill destroyed by fire. Estimated cost $35,000 to $40,000. Private plans.